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ABSTRACT

In November, 1990, over 500 environmental educators from North America, Latin America, and the Caribbean gathered to reflect on the accomplishments and weaknesses of the environmental education movement in San Antonio, Texas. The conference theme, Setting the Agenda for the 90's, helped to focus the presenters and participants on the achievements and limitations of the environmental education field. This volume attempts to present a complete account of the 1990 conference activities with an emphasis on the papers presented in the concurrent sessions. Each presenter's abstract or presentation summary is included in this volume. In cases where a longer paper was submitted, it follows the abstract. This volume is organized into: (1) "General Session Presentations," including the credentials of the general session speakers; (2) "Sectional Workshops"; (3) "Symposia," including the text of papers presented during six symposia; and (4) "Conference Presentations," including over 200 papers organized into 7 strands: "From Research to Application in Environmental Education"; "Educating About Environmental Issues and Policies"; "Curriculum & Teaching Strategies"; "Non-Formal Programs in Environmental Education"; "Cooperative Education Ventures"; "International Education Programs"; and "Promoting EE Programs." (CW)

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Setting the EE Agenda for the '90s

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SETTING THE EE AGENDA FOR THE '90S
1990 CONFERENCE PROCEEDINGS

Selected Papers from the Nineteenth
Annual Conference of the
North American Association for
Environmental Education

Edited by

Deborah A. Simmons
Clifford Knapp
Charlotte Young

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MISSION STATEMENT

The North American Association for Environmental Education (NAEE) is a professional association established to assist and support the work of individuals and groups engaged in environmental education, research, and service. In meeting the goals and needs of environmental professionals, NAEE promotes the analysis and understanding of environmental issues and questions as the basis for effective education, problem solving, policy-making, and management.

Through its activities, NAEE seeks to foster (1) the education of skilled individuals able to understand environmental problems and possessing the expertise to devise effective solutions to them, and (2) development of a citizenry conscious of the scope and complexity of current and emerging environmental problems and supportive of solution and policies which are ecologically sound.

NAEE is organized into three interactive sections each conducting specialized programs responsive to their members. These are:

NON-FORMAL EDUCATION SECTION (NFS) — is composed of individuals who work in education centers, zoos, museums, government agencies and industry. Their work often targets the public, youth groups, and schools in an informal setting.

ENVIRONMENTAL STUDIES SECTION (ESS) — is composed of individuals who work in higher education, including universities and four-year and two-year community colleges. The Section encourages a broad interdisciplinary approach to natural resources management and environmental problem solving.

ELEMENTARY & SECONDARY EDUCATION SECTION (ESES) — is composed of individuals who work in schools, school administration and higher education as teachers. They are involved in environmental education in the formal school setting as well as in the training of pre-service educators.

Professionals within these sections address the following audiences:

- the general citizenry;
- the fellow educators at all educational levels;
- those who make or facilitate the making of major decisions affecting the environment (e.g. government officials, scientists, engineers, planners, lawyers, journalists and mass communicators); and
- environmental resources managers (e.g. foresters, water resources managers, wildlife managers, park managers).

NAEE maintains the following guiding principles. Environmental Education should:

- consider the environment in its **totality** — natural and built, biological and physical phenomena and their interrelations with social, economic, political, technological, cultural, historical, moral, and aesthetic aspects;
- **integrate knowlege** from the disciplines across the natural sciences, social sciences, and humanities;
- examine the scope and complexity of environmental problems and thus the need to develop **critical thinking** and **problem-solving** skills and the ability to synthesize data from many fields;
- develop **awareness and understanding of global problems, issues, and interdepedence** — helping people to think globally and act locally;
- consider both short and long term **futures** on matters of local, national, regional and international importance;
- relate **environmental knowledge, problem-solving, values, and sensitivity** at every level;
- emphasize the role of **values, morality and ethics** in shaping attitudes and actions affecting the environment;
- stress the need for **active citizen participation** in solving environmental problems and preventing new ones;
- enable learners to play a role in **planning their learning experiences** and providing an opportunity for making decisions and accepting their consequences; and
- be a **life-long process** — should begin at a preschool level, continue throughout formal elementary, secondary, and post secondary levels, and utilize non-formal modes for all age and education levels.

PREFACE

In less than ten years we break through the futuristic time barrier known as the Twenty-first Century. Early predictions of life in the future ranged from lush utopias free of disease to a planet no longer able to sustain life as we know it. Now that we are so close to the year 2,000 it is easier to discern that if we continue our present form of development the future will be closer to the latter prediction of an unlivable world. But it is also true that there exist tremendous potential for an alternative future which is more in harmony with our planet.

It is just over twenty years since the environmental education movement started working with people to increase awareness about environmental problems and to engender new skills for working together to solve them. Although the field is still young, it is essential to reflect on our accomplishments and weaknesses; especially as environmental problems become more complex and global in scope. How well are we doing? Are we gaining ground? Are we working with the right audiences? Where to we go from here? Do we continue business-as-usual or are reforms to the field necessary?

These are the questions that over 500 environmental educators from North America, Latin America and the Caribbean tackled during the North American Association for Environmental Education's 19th annual conference in San Antonio, Texas between November 2-7, 1990. The conference theme, Setting the EE Agenda for the '90s, helped focus the presenters and participants on the achievements and limitations of the environmental education field. It challenged them to debate what changes in emphasis and techniques are necessary to meet the environmental challenges of the 1990s.

The participants choose from the widest-ever selection of conference activities. Organizers scheduled four featured speakers, five workshops, twelve field trips, five symposia, nine special events and over 200 concurrent sessions divided among seven strands.

To further participant's understanding of emerging environmental global issues the Environmental Studies Section of NAAEE introduced Global Briefings. Five specialists spoke on environment and development, global climate change, population and natural resources, and biological diversity. NAAEE members then described how they bring these complex issues into classrooms, environmental centers and other educational settings. For the first time a large number of participants from Latin nd the Caribbean attended the conference. Almost 40 Mexicans and another 20 persons representing Brazil, Chile, Costa Rica, Honduras, Venezuela and Dominica presented papers. In many cases these papers were delivered in Spanish. Simultaneous translation was available so that non-Spanish speakers could learn about environmental education efforts in Latin America and the Caribbean.

A special all-day symposium focused on environmental education in Mexico. The Spanish papers were collected into a special proceedings that will be distributed in Latin America and the Caribbean. A directory of Mexican environmental educators was also produced and is being distributed in Mexico. Copies of both publications are available from NAAEE headquarters.

Other highlights included day-long workshop on developing an environmental education agenda for the '90s while another workshop addressed the solid waste dilemma. Among the special events the Video and Film Festival featured the best new environmental releases of the year; and the Curriculum Review Fair displayed current and classic environmental education materials.

This volume attempts to present a complete account of the 1990 conference activities with emphasis on the papers presented in the concurrent sessions. Each presenter's abstract or presentation summary is included in this volume. All persons presenting at the conference were also invited to submit a 1,500 word paper for inclusion in this volume. If a longer paper was not submitted only the abstract appears. In cases where a longer paper was submitted the abstract is followed by the paper. Because of space limitations papers longer than 1500 words were edited. The papers are presented in alphabetical order, by author, within the strand in which the paper was presented at the conference.

Numerous persons worked to make the 19th NAAEE conference a success. Because of space limitations they cannot all be listed here but special mention must be made of several people. As Program Chair Kathy McGlauflin worked many long hours to assemble the best possible program. Kathy was a key figure in producing the conference Updates and Program. Alan Sowards, Local Events Chair, did an excellent job of planning and executing field trips, arranging for audio-visual equipment, and coordinating the local arrangements committee. Paul Zeph and his committee organized and executed nine special events. Each one is a major job by itself. Bora Simmons did an exceptional job of receiving and organizing the presentation proposals from over 200 presenters. Then she collected the papers to produce this volume. Isable Castillo was invaluable in organizing the Environmental Education in Mexico symposium. Finally Joan Heidelberg, NAAEE's Executive Vice President and the staff at headquarters did a super job of typesetting the copy for the updates and registering participants. Without the assistance of these people the conference would not have been possible.

Special thanks is given to World Wildlife Fund, Project Learning Tree, Texas Mid-Continent Oil and Gas Association and Northern Illinois University for their generous in-kind support to the conference. Thanks also to the Texas Association for Environmental Education (TAEE) who were the local hosts. Many of TAEE's members, by serving on the Local Arrangements Committee, contributed to the overall success of the meeting.

The financial support of World Wildlife Fund and the Office of International Affairs, National Park Service, made it possible for many Latin American and Caribbean participants to attend the conference. The special Spanish proceedings of the directory of Mexican Environmental Educators was only possible through the financial assistance of the Office of International Affairs, U.S. Fish and Wildlife Service. I especially want to thank the Edison Electric Institute for their continuing support of the conference.

Augusto Medina
Conference Chair and President-Elect

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I. GENERAL SESSION PRESENTATIONS

Four general session presentations were made during the conference. Unfortunately, texts of these presentations were not available in time for printing in the proceedings.

OUR ENVIRONMENTAL FUTURE--WHAT'S AHEAD?

Kathryn S. Fuller, President
World Wildlife Fund
The Conservation Foundation

Kathryn S. Fuller became President and Chief Executive Officer of World Wildlife Fund and The Conservation Foundation, two of the country's leading environmental organizations, in 1989. Prior to accepting her current position, Ms. Fuller served as Executive Vice President of World Wildlife Fund (WWF) and as General Counsel to WWF and The Conservation Foundation (CF). Before joining WWF in 1982, Ms. Fuller worked as a trial lawyer and later as chief of the Wildlife and Marine Resources Section of the U.S. Justice Department, a section she helped to create. She has written numerous articles on wildlife trade and international environmental issues, including innovative conservation funding mechanisms such as debt-for-nature swaps.

Ms. Fuller received her B.A. from Brown University, her J.D. from the University of Texas, and pursued graduate studies in Marine, Estuarine, and Environmental Science at the University of Maryland. Her field work has included wildebeest behavioral studies in the Ngorongoro Crater in Tanzania and coral reef crustacean studies in the U.S. Virgin Islands.

TEACHING ABOUT THE ENVIRONMENT: WHAT CITIZENS MUST KNOW

Dr. David Mathews
President and Chief Executive Officer
Charles F. Kettering Foundation

In 1981, Dr. Mathews became President and Chief Executive Officer of the Kettering Foundation, a research foundation that works on problems in science, education, international affairs, policy development and government problem solving--all with an emphasis on the role of the public.

Prior to his work with the Kettering Foundation, Dr. Mathews served as Secretary of the United States Department of Health, Education and Welfare (1975-77), as President (1969-80) and Professor of History at the University of Alabama where he taught for 15 years.

He received his B.A. degree in History and Classical Greek, graduating Phi Beta Kappa, from the University of Alabama and later received his Ph.D. degree in History from Columbia University. An author of books on higher education and democratic theory, Dr. Mathews has also written over 85 articles on such subjects as southern history and regional development, the making of public policy, federal social policy, and international problem solving.

BEYOND BUMPER STICKER ENVIRONMENTALISM

Dr. Louis Iozzi
Dean of Academics
Rutgers University

Dr. Louis A. Iozzi is Interim Dean of Academic and Student Affairs at Cook College, Rutgers University. He is the immediate Past President (1989) of the North American Association for Environmental Education, (NAAEE). Dr. Iozzi chaired the North American Commission for Environmental Education from 1981 to 1988. In 1988 he received the NAAEE's Research Award for Outstanding Contributions to Environmental Education Research.

Dr. Iozzi has authored or coauthored more than 90 research articles, books, monographs and other publications. He also serves as dissertation adviser to all students working on doctoral dissertations in Environmental Education at Rutgers University's Graduate School of Education. He has been a reviewer and/or an editor for several national research publications. Dr. Iozzi also chairs several research and advisory boards at state, national and international levels.

Dr. Iozzi's research interests focus on the moral aspects of problem-solving and decision-making related to issues in science and in environmental education.

ENVIRONMENTAL EDUCATION IN RURAL COMMUNITIES

Dr. Arturo Gomez-Pompa
Director, University of California Consortium
on Mexico and the United States

Dr. Arturo Gomez-Pompa was appointed Director of the University of California Consortium on Mexico and the United States and Professor of Botany at the University of California, Riverside in 1986.

Gomez-Pompa was founding director of Mexico's National Institute of Biotic Resources and former chairman of the Department of Botany at the National Autonomous University of Mexico. He also has served as ecology advisor to three Mexican presidents. His research interests include tropical forest conservation and regeneration, the application of traditional techniques to the management of tropical resources, pre-hispanic agriculture, and computers in floristic research. He is editor of the Flora de Veracruz Fascicles.

Gomez-Pompa is Chairman of the Plants Advisory Group of the International Union for the Conservation of Nature and Its Resources and World Wildlife Fund, a member of the National Academy of Sciences of Latin America, and a member of several committees of the National Academy of Sciences of the United States.

SECTIONAL WORKSHOPS

MULTICULTURAL ENVIRONMENTAL EDUCATION

This workshop explored outreach programs and techniques that use community resources to identify and engage local cultural groups. Dr. H. Prentice Baptiste, Chair of the Department of Educational Leadership and Cultural Studies, University of Houston, presented the keynote address. Working with the San Antonio Museums Association and the National Park Service, participants examined methods for outreach and bringing multicultural environmental education programs into monocultural communities. Highlighting the workshop was a field trip providing a first-hand look at local multicultural environmental education programs.

*Sponsored by the Non-Formal Section

ANALYZING AND INVESTIGATING ENVIRONMENTAL ISSUES

Using thoroughly developed and validated instructional models, workshop leaders helped middle and secondary school teachers (Grades 5-12) learn how to train students in the skills associated with the critical analysis and investigation of environmental issues.

Participants received practical and direct (hands-on) experiences for their professional skill development. Actual issues were used for analyses and a variety of media/information sources were used. Issue analysis focused on the identification of key aspects of environmental issues, e.g. 1) theplayers, their position, beliefs and values, 2) the alternative solution proposed for issue remediation, and 3) the ecological and socio-cultural consequences of these solutions. Workshop participants received the published materials which support these skills.

Workshop leaders: Harold Hungerford, Martha Kronholm, John Ramsey, Trudi Volk.

*Sponsored by the Elementary-Secondary Education Section

ENVIRONMENTAL EDUCATION AGENDA DEVELOPMENT FOR THE '90s

At this workshop, participants met to review and discuss "An Environmental Education Agenda for the 1990s." By working in small groups with members of the committee which developed this document, participants helped NAAEE develop a specific blueprint to implement the Agenda.

NAAEE believes that there is increased support for environmental education in North American and that a bold agenda for promoting the effectiveness and influence of environmental education is needed. To help formulate this agenda, NAAEE called together leaders from education, the private sector, foundations and the political arena. This group met in May of 1990 to discuss key topics likely to be of importance to environmental education and NAAEE for the coming decade.

*Sponsored by the NAAEE Board of Directors in conjunction with the Kettering Foundation

OUR LIFESTYLES AND THE SOLID WASTE DILEMMA-- HOW DO WE MAKE A DIFFERENCE?

NAAEE members collaborated to present a comprehensive look at current lifestyle trends as they relate to the mounting solid waste problem.

Participants heightened their personal awareness and appreciation of the solid waste crisis while developing their knowledge, skills and action strategies through a variety of learning modalities. Each participant received information and instructional materials with which to make informed choices in their lives and to assist them in educating their students. Presenters included specialists from the fields of education, public relations, solid waste management and other related professions. A special guest was Recyclus (SM), the national recycling and waste reduction superhero.

Workshop leaders: Marc Breslav, Paige Denslow, Steve Fish, Rhonda Hunter, Roy King, Frank Knight, Melva Okun, Bora Simmons, Joel Stone, Mary Sue Topper and Dennis Yockers.

*Sponsored by the Elementary-Secondary Education Section

THE EDWARDS AQUIFER: A RIVER OF CONTROVERSY

The Edwards Aquifer is the major source of urban and rural freshwater in south-central Texas. The aquifer lies, in part, beneath the rapidly growing city of San Antonio, Texas. Conflicts exist over aquifer depletion and contamination, the apportionment of water rights and the socio-economic and environmental consequences of current and future water resource use in south-central Texas.

This workshop featured a day long field trip to urban and rural sites affected by the conflicts. Locations included Natural Bridge Caverns, Comal Springs and San Marcos Springs (glass bottom boat excursion), Recharge/Sink Hole, and urban and agricultural sites. A dinner cruise on the San Antonio River was also featured. Participants visited the Edwards Aquifer Research and Date Center in San Marcos, Texas and spent a half-day session with experts on water resource management in south-central Texas.

Workshop leaders: Dr. John Baldwin, Dr. Paul Robertson, Dr. Glenn Longley

*Sponsored by the Environmental Studies Section

SYMPOSIA

Symposium 1: Global Briefings

The Global Briefings Symposium is a new event which will further our understanding of emerging environmental issues of global significance. Six one-hour sessions are planned for the symposium.

A GLOBAL OVERVIEW: TRENDS IN ENVIRONMENTAL AND DEVELOPMENT

Mary E. Paden
World Resources Institute
Washington, D.C.

I'm going to give you a global overview of conditions and trends in a number of key environmental and resource areas. Some of these trends may surprise you. You may also be surprised at the lack of data in areas that seem like they would be well monitored. Did you know for example that the first global survey of deforestation was published in 1980 and that it won't be updated until 1992? Despite the lack of comprehensive data in certain areas, many trends indicate that action is needed to stop deteriorating conditions. Thus, we must teach, debate, form opinions and make policies based on our best estimates.

It is also important to understand the interconnections among various issues and the sometimes complicated cause-effect cycles that can be set in motion. For example, in tropical forests, deforestation of large areas can cause local climate to become dryer--thus unsuitable for the regrowth of the rainforest.

For most of my data I will draw on the World Resources Report, of which I am managing editor. This report contains the only collection of data on global environmental conditions and trends. Our data is not complete, not perfect, but it's the best assessment we can muster of where we are and where we are going.

First I'll give the conditions and trends for four clusters of global issues: The Air and the Sky, the Creatures and the Land, the Fishes and the Sea, and People and Poverty. Then I will challenge two myths about environment and development. I hope to leave you with a framework in which to fit the talks you will hear later during this workshop on climate change, biodiversity, population, and development and poverty.

The Air And The Sky

There are three major problems in the atmosphere: climate change, ozone depletion, and air pollution. These are distinct but interconnected problems. Global warming and air pollution are both caused by burning fossil fuels. Climate change is also caused by the release of methane from livestock and rice paddies and by deforestation. Ozone depletion is caused by manufactured chemicals called CFCs, which are also one of the greenhouse gases that cause climate change. So these atmospheric problems are caused by a mixture of developed and developing countries engaging in industry, transportation, and agriculture. The solutions will involve both local actions and international negotiations. Let's look at the trends in these problems separately.

Climate Change

We cannot detect climate change yet, but we know that if carbon dioxide and other greenhouse gases do indeed cause a warming of the atmosphere, we are already in trouble. Gases already in the atmosphere could cause a temperature increase of several degrees Fahrenheit by 2030.

We know two things for sure about climate change: 1) greenhouse gases that absorb infrared rays keep the atmosphere warmer than it would be otherwise, and 2) concentrations of greenhouse gases are increasing at unprecedented rates. **Figure 1** shows how temperature changes have corresponded to atmospheric levels of carbon dioxide over 160,000 years. Thus many scientists conclude from this correlation that increased emissions of carbon dioxide will lead to a warmer world. Here they get into some arguments because the atmosphere is quite complicated. Bill Moomaw of Tufts university, former director of the WRI climate program, will explain atmospheric interactions later.

Let's assume for the moment that this theory is correct. If by 2030 the average temperature does increase 1.8 to 4.5 degrees Fahrenheit just as a result of emissions already in the atmosphere today there could be tremendous disruptions in weather patterns and storm frequencies. In some places good farming areas would dry out, forests would die; some might reseed further north, some wouldn't. As both temperature and vegetation change, animal species would migrate or die out. Low coastal areas would be flooded, fish migration patterns would change and generally things would be very confused for some time.

Thus it seems reasonable to examine ways to control these greenhouse gases. Let's look at exactly where these greenhouse gases are coming from. This summer the World Resources Report published the first Greenhouse Index showing estimates of the greenhouse gas emissions of each country. **Figure 2** shows the emission of the top 20 countries. Note that the U.S. and USSR are first and second as you might expect with the European Community third. Clearly industrialized countries are the major culprits. But note the inclusion of China, India, and Brazil--three large developing countries included for emissions of carbon from deforestation and methane from agriculture as well as use of fossil fuels. All these major emitters will have to reach an agreement on reducing emissions.

The Ozone Hole

This problem smacks of science fiction--an inert chemical used to propel aerosol sprays and cool refrigerators wafts up to the stratosphere and destroys ozone molecules that shield us from deadly ultraviolet rays. Farfetched but true. The trend of CFCs emitted into the atmosphere has been steadily upward over the past 15 years as you can see from **Figure 3**. Ozone over Antarctica has thinned dramatically in 1987 and 1989 (**Figure 4**) and reduced levels have been measured at other latitudes. Now we have international agreements to slowly reduce production of CFCs and manufacturers are developing substitutes. The agreements were hailed as major victories--the first time a group of nations has acted fairly quickly on an environmental problem. This agreement set a precedent for negotiations on climate change, which will be much more difficult because they will involve cutting back emissions from basic services such as transportation, industry, and agriculture rather than the manufacture of a single groups of chemicals.

Air Pollution

One of the original environmental issues, air pollution has been eclipsed in the United States by fancier atmospheric problems. Yet air pollution is growing worldwide and it is the problem that most directly affects human health. **Figure 5** shows that most of the world's air pollution is generated by the northern industrial countries. But while cities in developed countries are generally holding steady or getting cleaner, the megacities in developing countries are getting dirtier. **Figure 6** shows the worsening situation in number of Third World cities.

The Creatures And The Land

Biological Diversity

We are losing species at a rate faster than any time in the past 65 million years. We can't tell what percentage of species we have lost because we don't know how many species there are; estimates range from 10 to 30 million. (We think most are beetles). **Figure 7** shows the escalation in extinctions of birds and mammals between 1600 and 1950. We are losing species because we are destroying their habitats, disrupting their food chains, polluting their environment, shooting them for skins, meat, horns, or ivory, or poisoning them with pesticides. Soon we may be changing their climate--making it too hot or too dry for them to live where they are. We need a large variety of plants and animals to maintain a storehouse of genetic diversity for agriculture and medicine. We need the ecological services of trees that cool local climate, wetlands that break storm waves, and grasses that prevent erosion. But maybe most important, our spirit would suffer from the loss of these plants and creatures that are part of our world.

Take the elephant, a well loved species, that is being massacred for its ivory in many African states by poachers. Elephant numbers have dropped from 1.3 million in 1979 to 625,000 in 1989. **Figure 8** shows the decline of herd sizes in four areas of Africa. Some biodiversity researchers are critical of those who concentrate on saving "charismatic megafauna" like elephants, but really, what can we say for ourselves if we can't save the elephant? Some African countries, such as Botswanna, Zimbabwe, and South Africa, have well managed elephant herds, so we see it is possible. In an attempt to stop the poaching, nations belonging to the Convention on International Trade in Endangered Species agreed to ban the import of ivory, thus restricting the poacher's market.

Deforestation

The single act that is causing more loss of biodiversity than anything else is tropical deforestation. We've known deforestation was a major problem for several years, but this year we found out it is even worse than we thought. Recent studies of deforestation in nine tropical countries show considerably more deforestation than earlier studies in those same countries had shown. We estimate that the total world deforestation peaked at about **20 million** hectares in 1987, an area almost the size of West Germany. Because of lower deforestation rates in Brazil, the total has fallen somewhat since then. **Figure 9** shows the growth in the deforestation estimates in nine countries. **Figure 10** shows the location of tropical deforestation as of 1988. Most of the worlds deforestation currently takes place in the tropical forests. Temperate forests were mostly chopped down in previous centuries and they now show little change from year to year.

Tropical forests are mainly cleared for agriculture and ranching--as temperate forests were. But there is a cruel irony--a payback--to settlers who clear tropical forests. Without the forest, both the climate and the soil deteriorate eventually rendering the land economically worthless. Tropical forests maintain a moist microclimate; their deep roots tap groundwater and their leaves shade the ground. When the trees are cut down, the area dries out. Thin tropical soil loses its nutrients within a few years if trees are not allowed to regrow. Land used for pasture for even a few years can take up to 100 years to regenerate a forest.

Desertification

Drylands that are misused or overused face the possibility of desertification or drying out. Drylands are productive but fragile. Most are used for agriculture or livestock production and they are home to many of the world's poorest peoples. An example of misuse is improperly drained irrigation that eventually turns the soil salty. an example of overuse is herding too many livestock which can not only strip the land of vegetation but compact the soil so that it cannot absorb the little water that does fall.

The degradation of dry lands is a major world environmental problem. It gets less press than other problems. It gets less money. And not much is being done about it. It affects mainly rural poor people who have little political clout. **Figure 11** shows a map of areas at greatest risk of desertification. If the climate changes, these dry areas are predicted to become even drier.

The Fishes And The Sea

The Ocean is also in trouble. A group of experts on marine pollution were appointed by the United Nations to report on the health of the world's ocean. Their report issued last spring said that most of the world's coastal waters are now polluted. Thus the trend is toward more ocean pollution. This pollution consists of the following 1) nitrogen from sewage and runoff from land 2) pesticides and other chemicals 3) oil and 4) plastic debris, which has been found everywhere in the world. The report also found that in many areas where people dumped sewage, fished, and swam there were reports of food poisonings from eating contaminated shellfish and infections caused by swimming in contaminated waters. **Figure 12** shows areas of severe ocean pollution: note that it includes most of the world's enclosed seas.

The Fish

The amount of fish caught in the world's ocean has climbed steadily driven by demand and advances in technology. It is now at the limit the U.N. Food and Agricultural Organization has estimated is the sustainable limit of the world fishery. (**See Figure 13**) Fishing is affected by both pollution and by overfishing. In four areas--the Mediterranean, the Northwest Pacific, the Southeast Pacific, and the eastern Indian Ocean--catches in recent years have exceeded the sustainable limit.

Because fish populations naturally fluctuate, it is difficult to determine when pollution or overfishing are causing a population decline. Thus it is hard to restrict fishing--putting people out of work--when you can't prove a long term decline is beginning. Yet without restrictions we are sure to exceed the sustainable limits of the sea and the fish may not be able to bounce back.

Several times in the past technological advances in fishing gear has caused rapid depletion of fish stocks. The most recent technological advance is the driftnet. Up to 35 miles long and 30 miles deep, these nets are set adrift all night and they virtually strip mine the seas of all life--whales, dolphins, and turtles as well as fish. They are used in the Pacific and in the Mediterranean.

Some Connections

Just to recognize the interconnectedness of things, lets look at the effects on the ocean of some of the problems mentioned above. Global warming would warm ocean water and cause it to expand, thus raising the sea level. It could also melt some polar ice, further raising sea levels. Coastal flooding would not only be difficult for shoreline property owners, it would also drawn marshes and mangrove areas where many fish breed. Warmer water might also kill coral reefs, which live near the top of their temperature tolerance. Lack of ozone protection may allow ultraviolet rays to kill tiny plankton in the surface of ocean water. These plankton are the base of the aquatic food web. Air pollution can actually affect fish--waters of the Chesapeake Bay receive much of their acid input from air pollution.

The ocean has fewer endemic species than the land, however the most biologically diverse marine life tends to be found in some of the most vulnerable habitats: coral reefs, mangrove areas, and coastal marshlands. These areas are often destroyed by fishing techniques, pollution, and coastal development.

Deforestation leads to soil erosion, which clogs streams, rivers, and coastal areas with sediment. Suspended sediments kill submerged aquatic plants, which serve as food for many organisms, by blocking their sunlight. And sediment smothers shellfish beds and reefs.

People And Poverty

The growth curve of the human population is the steepest of any of the trend lines we have to show. (**See Figure 14**) Most of this growth in developing countries. The growth in most developed countries has stabilized. Obviously, large numbers of people can affect the environment by using up resources and by polluting. When looking at people/environment interactions, it is necessary to look at just how much resources are used or pollution created per capita in different regions. **Figure 15** shows use of energy per capita in the U.S., the European Community, Japan, China and India. Note that while India has a much larger population than the U.S., its per capita use of energy is so much lower that it has an overall lower energy use. As India develops it will use more energy per capita. **Figure 16** projects total energy use if India used as much energy per capita as the U.S. You can see this could cause problems in resource availability, pollution, and greenhouse gas emissions. This is one of the basic issues in environmental discussions with developing countries. Developing countries naturally want to develop--to have a better life--like they see us having. Some environmentalists see a conflict between environment and development in the United States and in the developing world--as if you could only have one or the other. However, most environmentalists who work in the developing world see that these countries must develop to meet the needs of their people. The question is: Can they take a path to development that is less consumptive and polluting than the path we took? How are developing countries developing? The Newly Industrialized countries have created a middle class and a better life for most of their citizens. On the other hand many countries are either holding steady or actually sliding backwards in providing urban services, jobs, safety, and environmental protection for their citizens. More than 1 billion people in developing countries live in absolute poverty. Although the percentage of the population in absolute poverty shrank between 1970 and 1985 the total number of people in poverty increased by one-fifth because of the growing population. About three quarters of these poor are clustered in environmentally fragile areas with low agricultural potential. Environmental degradation and poverty reinforce each other. Many of the poor live in shantytowns built around large cities. Most cities have been unable to keep up with their population growth in terms of providing services. For example sanitation service--a basic health and environmental service--reaches a smaller percentage of the population than it did 10 years ago, despite the installation of more services, because the population grew faster than the sewers were built. (**See Figure 17**)

Gross National Product per capita has declined in many developing countries over the past 10 years. The cause is generally recognized as a combination of the falling prices for raw materials and agricultural commodities (the major exports of most developing countries), large payments on debts to private and multilateral banks, and in some cases, poor management or government corruption.

So most developing countries are having a hard time right now. If they don't develop, they will find more and more citizens living in poverty, degrading marginal farmland, cutting forests, polluting waterways. On the other hand if they do develop as we did they would place heavy demands on nonrenewable resources such as oil, and cause major atmospheric pollution.

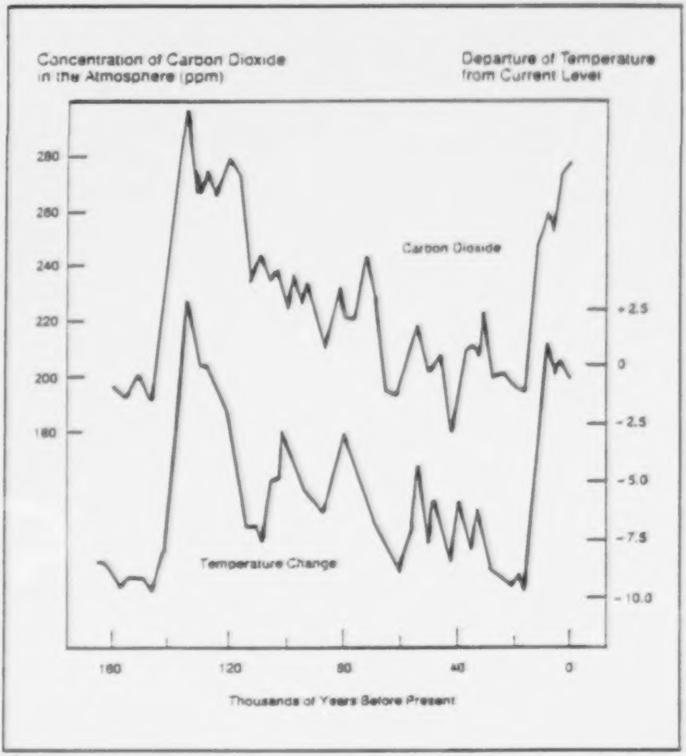
Hopeful Indicators

There are two indicators that point to a way out of this dilemma. These indicators counter two myths about environment and development. The first myth is that a country must get rich in order to provide its citizens with a good life, or conversely that people in poorer countries are doomed to substandard conditions. One indicator--the Human Development Index (HDI) developed by the United Nations Development Programme--shows basically that you don't need a lot of money to live a good life. The HDI attempts to measure the well being of a country's citizens in terms of health, education, and economics. When countries ranked by GNP and HDI are plotted on the same graph it is clear that there is no automatic link between the level of per capita income in a country and the level of its human development. (**See Figure 18**) A country with a low GNP can have a much higher HDI if it has government policies that foster education, health, and income distribution.

The second myth is that a country must use a lot more energy in order to develop. The second indicator, the Energy Intensity Index, shows that you don't need a lot of energy to be a highly developed country. This index measures kilojoules of commercial energy used per dollar of GNP. As you can see France and Japan--both highly developed countries--are under 10,000. The United States is double that--just above 20,000. Thus we use twice as much energy as France and Japan to produce a single dollar of GNP. Now look at some major developing countries: India, 26,000; China, 43,000; Venezuela, 30,000; Egypt, 34,000. (**See Figure 19**) All are higher than even the United States. Clearly there is room for energy conservation technology in these countries. It's also interesting to look at the trends in energy intensities. **Figure 20** shows that energy intensity for all developed countries went down as oil prices went up. In other words when energy got expensive, countries figured out how to produce the same dollar of GNP with less energy use. It seems possible that developing countries could do the same.

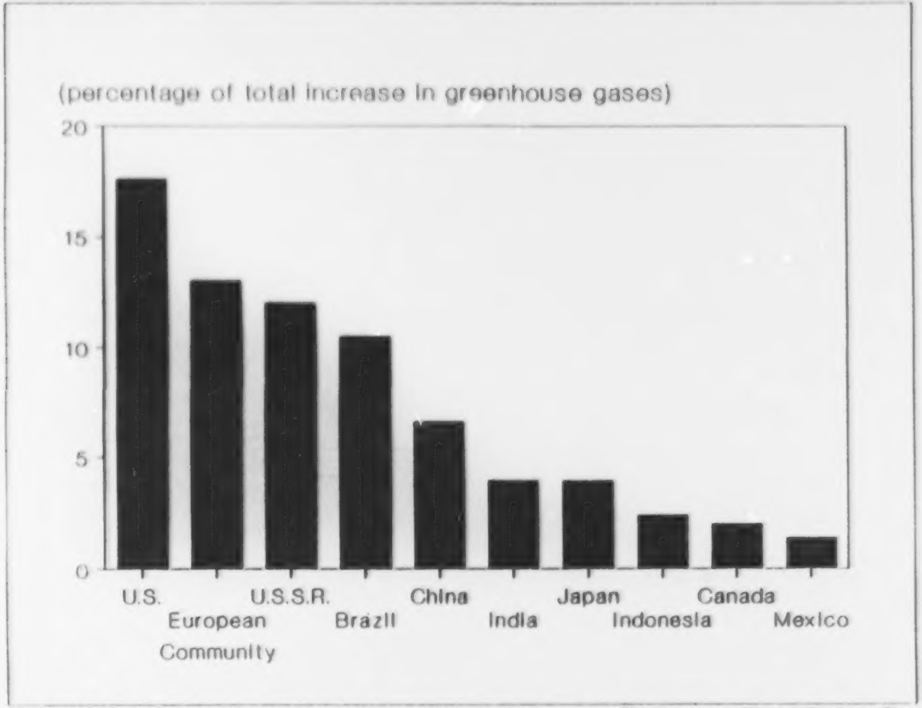
You can easily see that much of the future of the world's environment lies in the hands of developing countries. And I hope you can see that environmental quality must go hand in hand with development. The future of the rainforests, of many species, of the productivity of the land itself depends on people finding new paths of development--sustainable development that produces rewards in the present without draining the resources upon which it is based. The challenge to use as environmentalists, educators, researchers is to present a clear picture of global environmental issues to our colleagues and students, to work with developing countries when possible, and to work toward U.S. policies that promote sustainable development, both here and abroad.

Figure 1 Long-Term Variations of Global Temperature and Atmospheric Carbon Dioxide



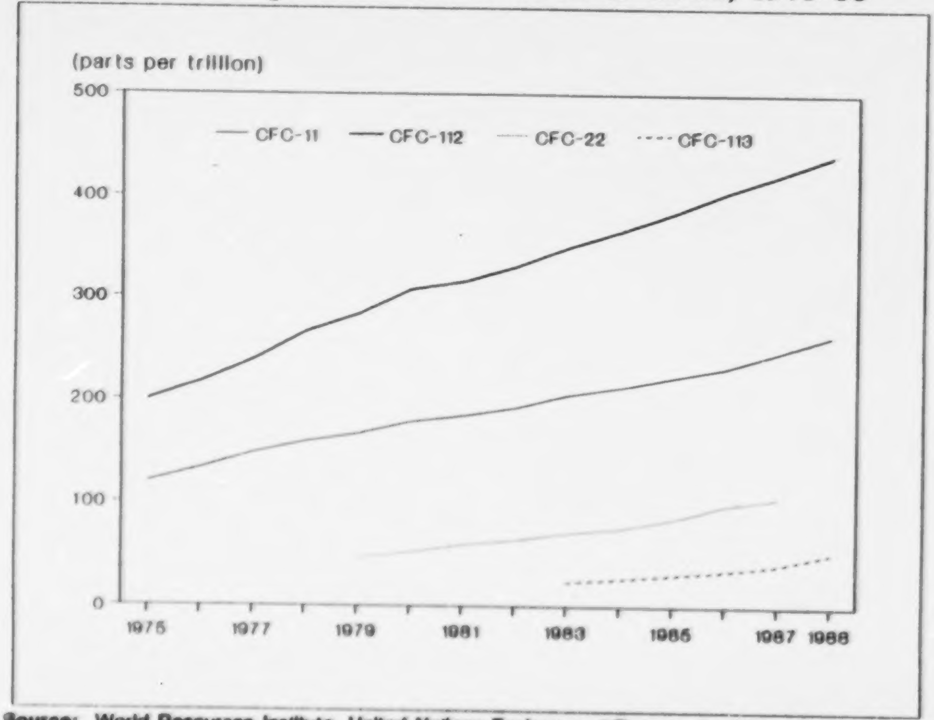
Source: J.M. Barnola et. al., "Vostok Ice Core Provides 160,000-Year Record of Atmospheric CO_2," *Nature* Vol. 329, No. 6138 (1987), p. 410.

Figure 2 Ten Countries with the Most Greenhouse Gas Emissions



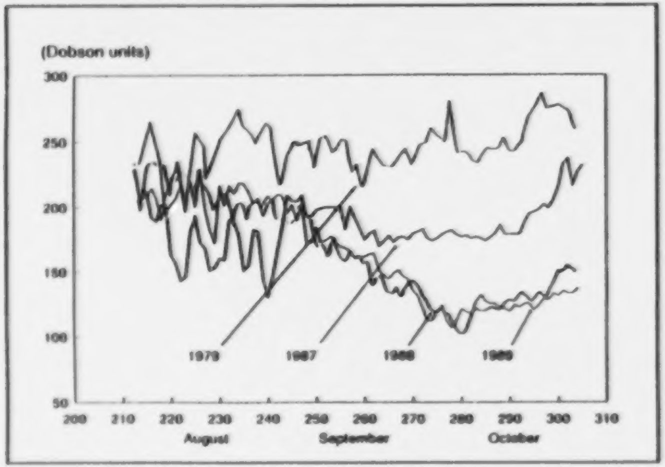
Source: World Resources Institute, United Nations Environment Programme, United Nations Development Programme, *World Resources 1990-91* (Oxford University Press, New York, 1990), p. 3.

Figure 3 Atmospheric Concentrations of CFCs, 1975-88



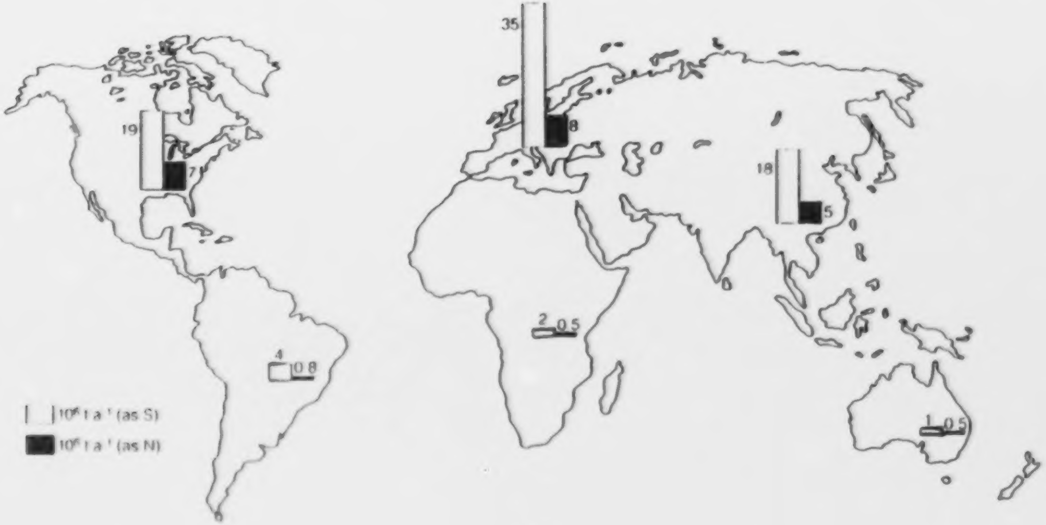
Source: World Resources Institute, United Nations Environment Programme, United Nations Development Programme, *World Resources 1990-91* (Oxford University Press, New York, 1990), Table 24.3, p. 350.

Figure 4 Concentration of Ozone Above Antarctica, 1970-89



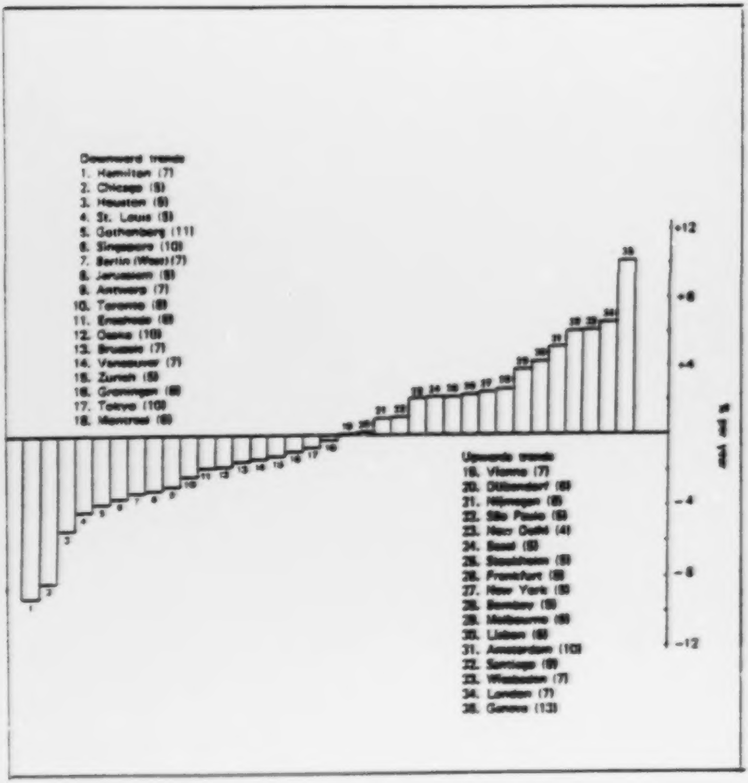
Source: Dr. Arlin J. Kreuger, Laboratory for Atmosphere, U.S. National Aeronautics and Space Administration, Goddard Space Flight Center, Greenbelt, Maryland, 1989.

Figure 5 Emissions of Sulphur and Nitrogen Oxides by Continent, 1979


35
8
19
7
18
5
2
0.5
4
0.8
1
0.5
□ 10^6 t a^{-1} (as S)
■ 10^6 t a^{-1} (as N)

Source: United Nations Environment Programme, *Environmental Data Report*, (Basil Blackwell, London, 1990), p. 13.

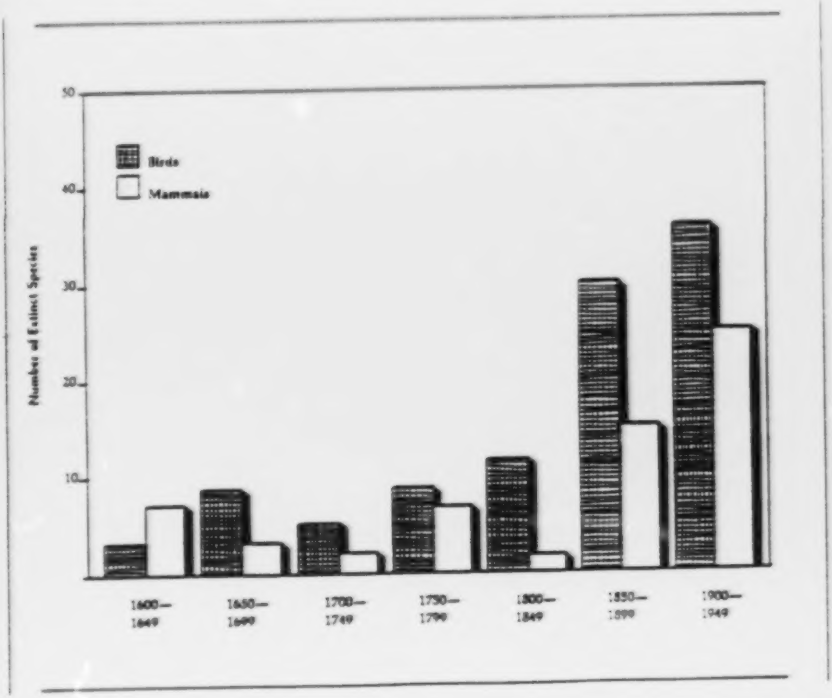
Figure 6 Air Pollution Trends in 35 Cities



Source: Global Environment Monitoring System, *Assessment of Urban Air Quality* (United Nations Environment Programme and World Health Organization, London, 1988), p. 42.

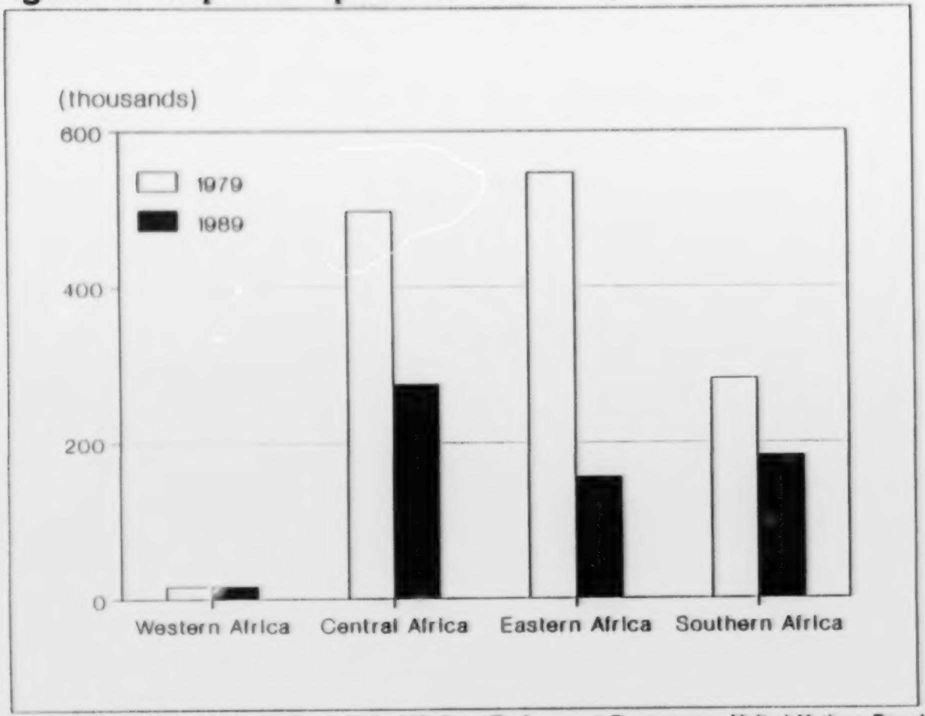
Note: Trends in annual average NO_2 concentrations in cities. Values in brackets refer to the number of sampling years.

Figure 7 Number of Species of Birds and Mammals that became Extinct Between 1600 and 1950



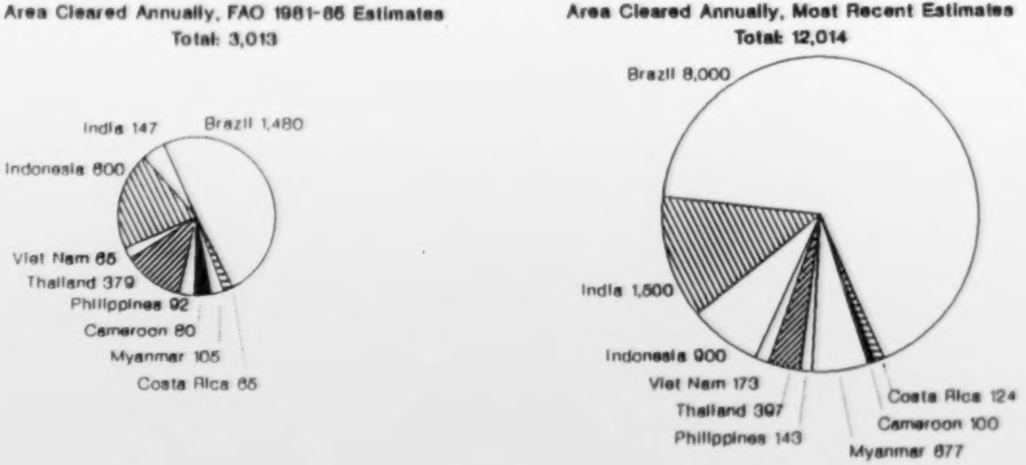
Source: World Resources Institute (WRI), *Keeping Options Alive.* (WRI, Washington D.C., 1990), p. 34.

Figure 8 Elephant Populations in Africa, 1979[a] and 1989



Source: World Resources Institute, United Nations Environment Programme, United Nations Development Programme, *World Resources 1990-91* (Oxford University Press, New York, 1990), p. 8.

Figure 9 Area of Closed Forests Cleared Annually in Selected Tropical Countries, 1980s



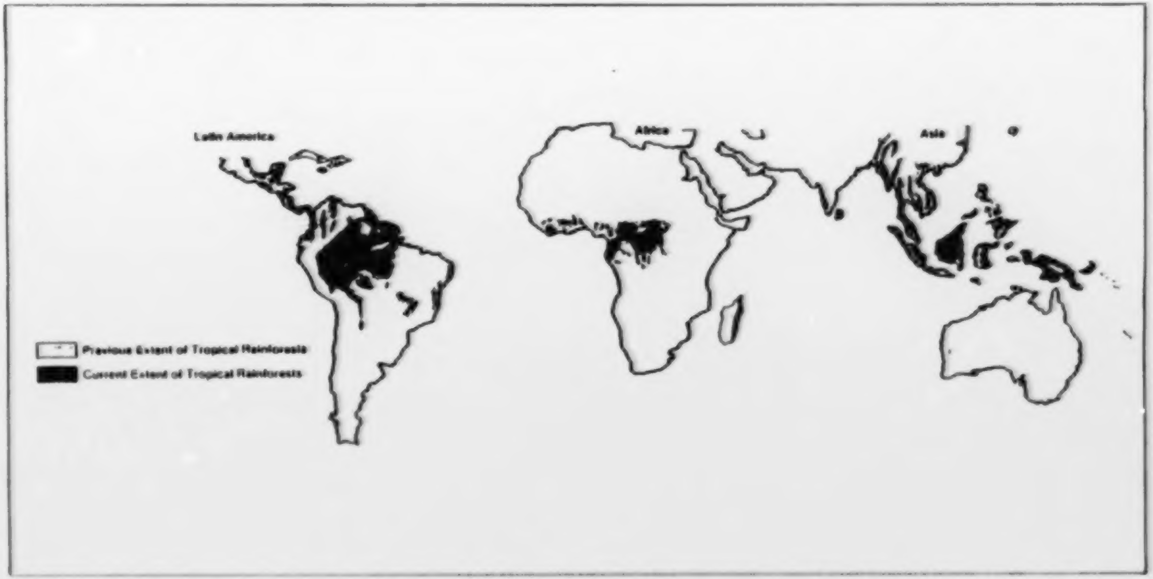
Area Cleared Annually, FAO 1981-85 Estimates
Total: 3,013

Area Cleared Annually, Most Recent Estimates
Total: 12,014

Source: World Resources Institute, United Nations Environment Programme, United Nations Development Programme, *World Resources 1990-91* (Oxford University Press, New York, 1990), p. 103.

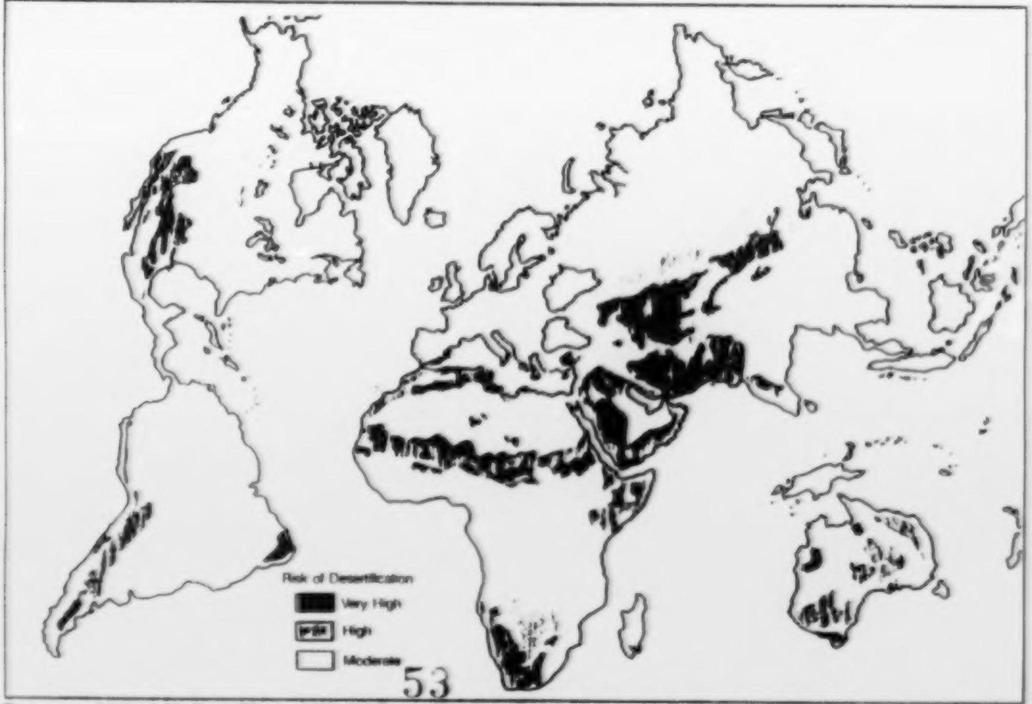
Note: This figure shows the area lost to deforestation in nine tropical countries as calculated by the Food and Agriculture Organization of the United Nations (1981-85) and by more recent estimates. Note that the country with the largest percentage loss (Costa Rica) actually has the smallest area lost.

Figure 10 Extent of Tropical Deforestation


Latin America
Africa
Asia
Previous Extent of Tropical Rainforests
Current Extent of Tropical Rainforests

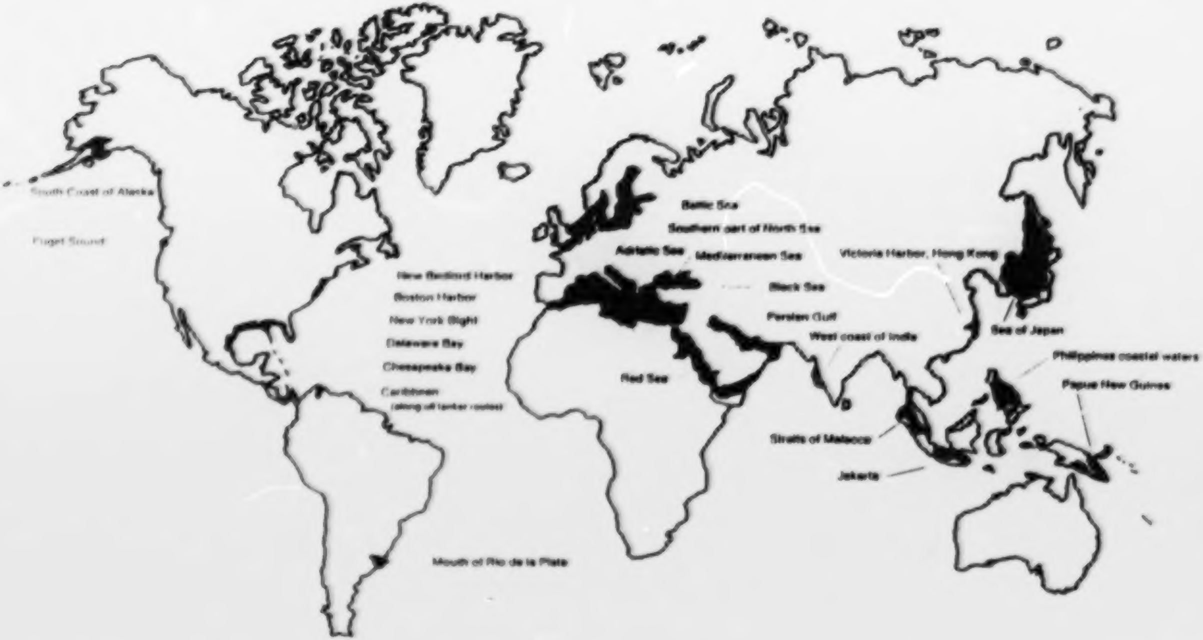
Source: Tropical Rainforests: A Disappearing Treasure (Smithsonian Institution, Washington D.C., Traveling Exhibition Service, 1988).

Figure 11 Areas at Risk of Desertification


Risk of Desertification
Very High
High
Moderate

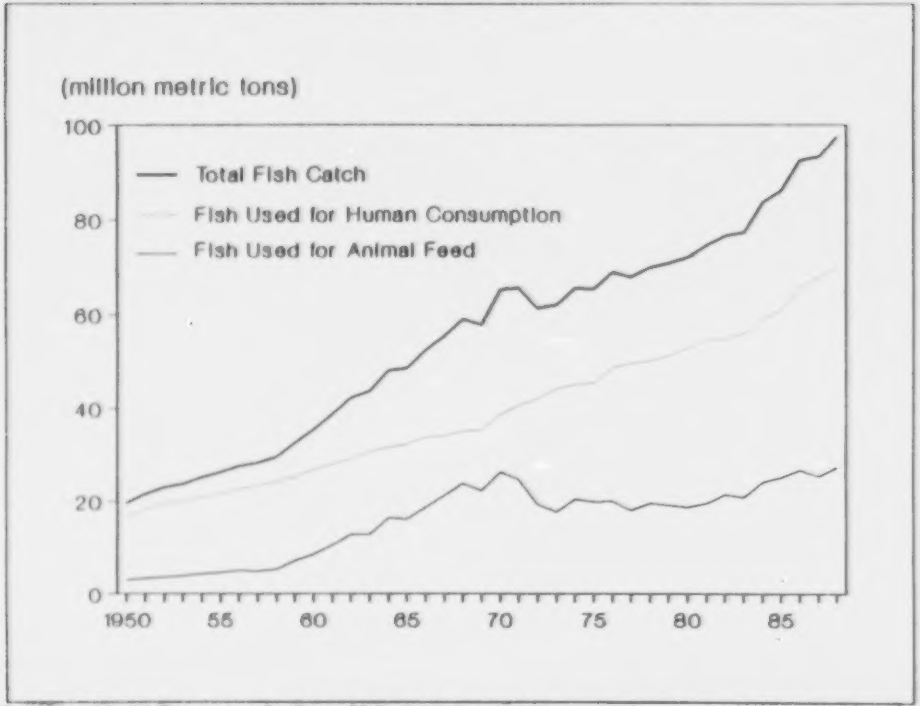
Source: *United Nations Map of World Desertification*, Food and Agriculture Organization of the United Nations, United Nations Educational, Scientific, and Cultural Organization, and the World Meteorological Organization for the United Nations Conference of Desertification, Nairobi, Kenya, 1977.

Figure 12 Hot Spots of Coastal Ocean Pollution


South Coast of Alaska
Puget Sound
New Bedford Harbor
Boston Harbor
New York Bight
Delaware Bay
Chesapeake Bay
Caribbean
(along oil tanker routes)
Mouth of Rio de la Plata
Baltic Sea
Southern part of North Sea
Adriatic Sea
Mediterranean Sea
Black Sea
Persian Gulf
Red Sea
West coast of India
Victoria Harbor, Hong Kong
Sea of Japan
Philippines coastal waters
Papua New Guinea
Straits of Malacca
Jakarta

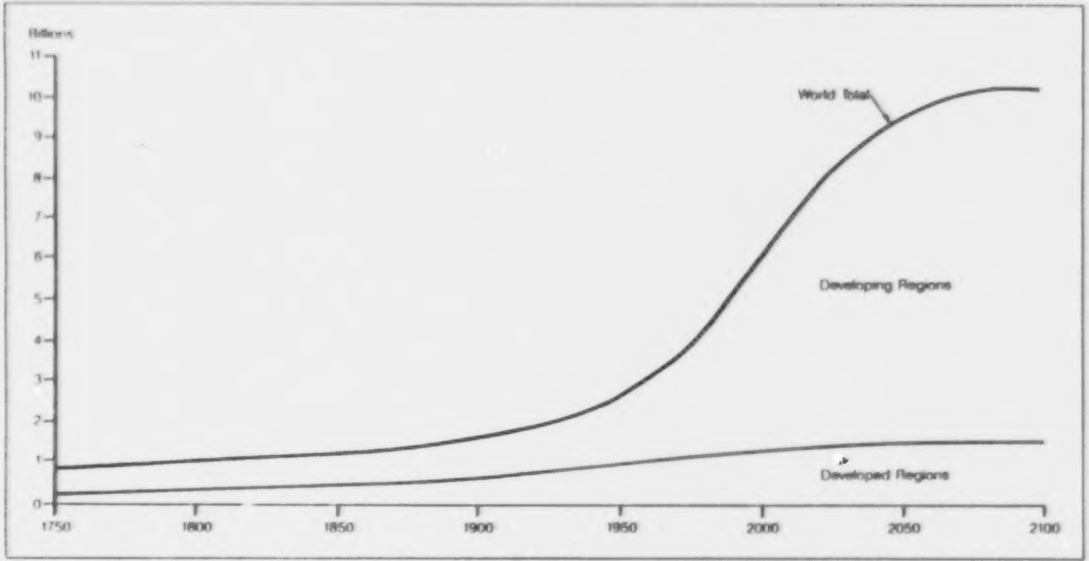
Source: Personal communications with authors of the U.N. GESAMP report, *The State of the Marine Environment*, (United Nations Environment Programme, Nairobi, 1990).

Figure 13 World Fish Catch, 1950-88



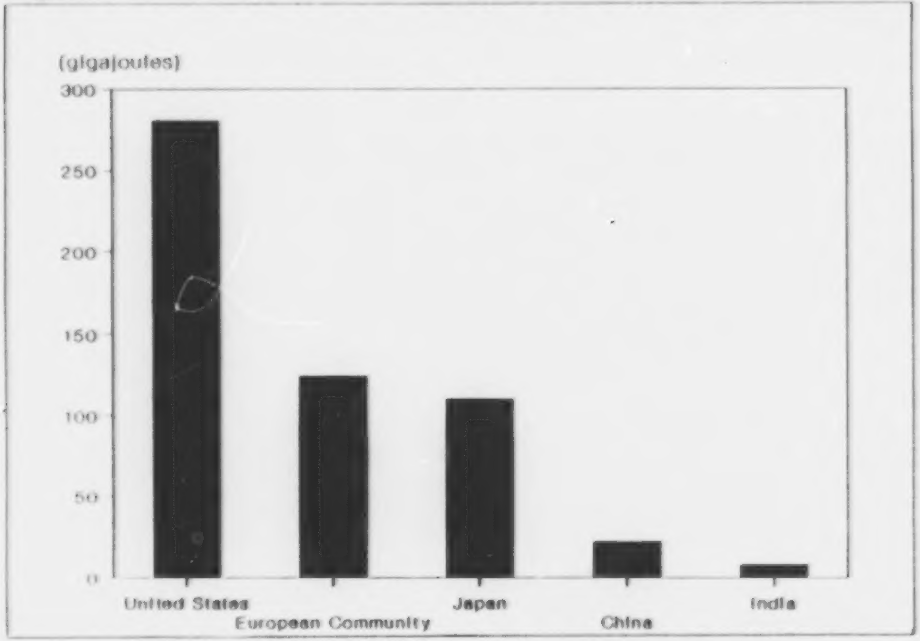
Source: World Resources Institute, United Nations Environment Programme, United Nations Development Programme, *World Resources 1990-91* (Oxford University Press, New York, 1990), p. 180.

Figure 14 Population Growth, 1700-2100



Source: Thomas W. Merrick, et. al., "World Population in Transition," *Population Bulletin Vol. 42, No. 2 (1986), Figure 1, p. 4.*

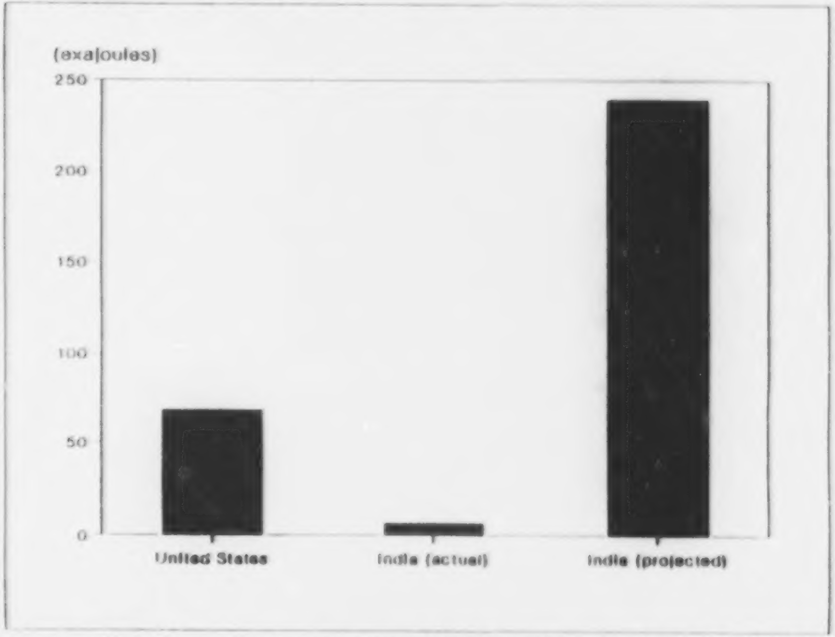
Figure 15 Energy Use Per Capita for Selected Countries



Source: World Resources Institute, United Nations Environment Programme, United Nations Development Programme, *World Resources 1990-91* (Oxford University Press, New York, 1990).

Note: 1 gigajoule = 947,800 BTUs

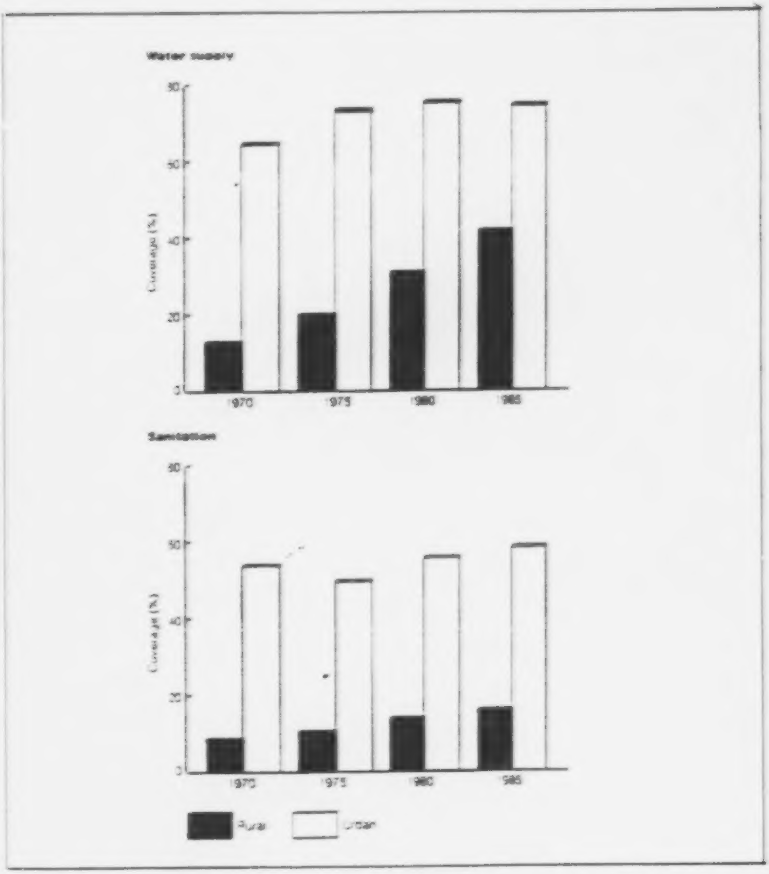
Figure 16 Projected Energy Use for India if India Used as Much Energy Per Capita as the U.S.



Source: World Resources Institute, United Nations Environment Programme, United Nations Development Programme, *World Resources 1990-91* (Oxford University Press, New York, 1990).

Note: 1 exajoule = 947,800,000,000,000 BTUs

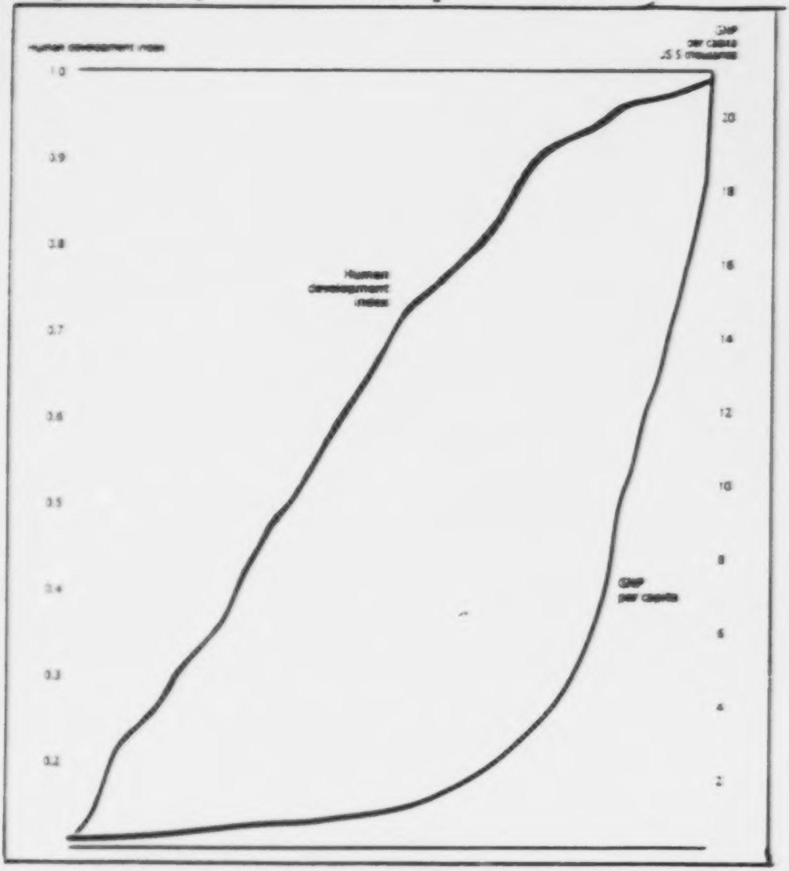
Figure 17 Trends in the Percent of Population with Water and Sanitation Services in Developing Countries, 1970-88



Source: United Nations Environment Programme, *Environmental Data Report*, (Basil Blackwell, London, 1990), p. 323.

Note: a. Excluding China

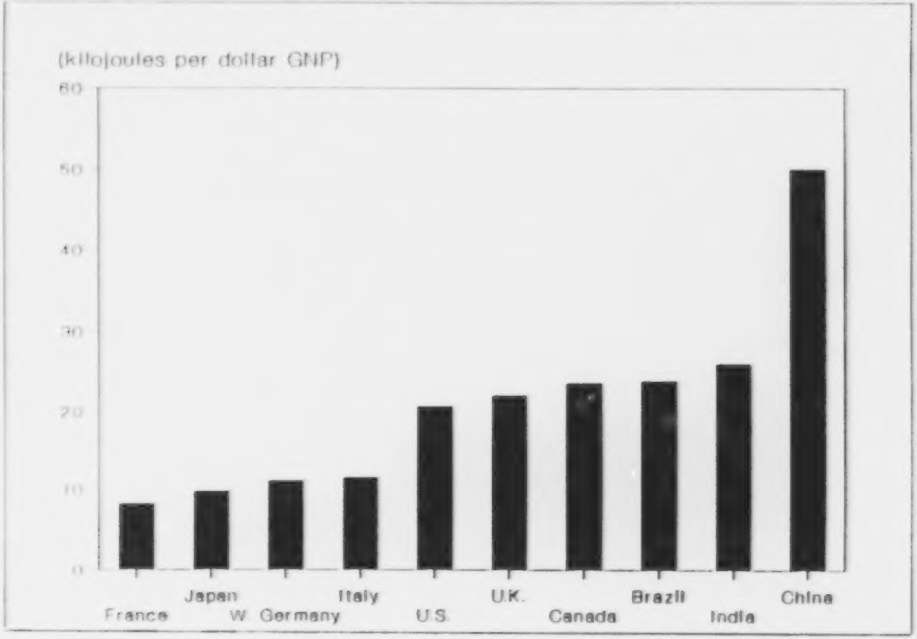
Figure 18 Ranking of 130 Countries' by GNP per Capita and by Human Development Index



Source: United Nations Development Programme, *Human Development Report 1990*, (Oxford University Press, New York, 1990), p. 15.

Note: The two curves reveal that the disparity among countries is much greater in income than in human development. There is no automatic link between the level of per capita income and the level of its human development.

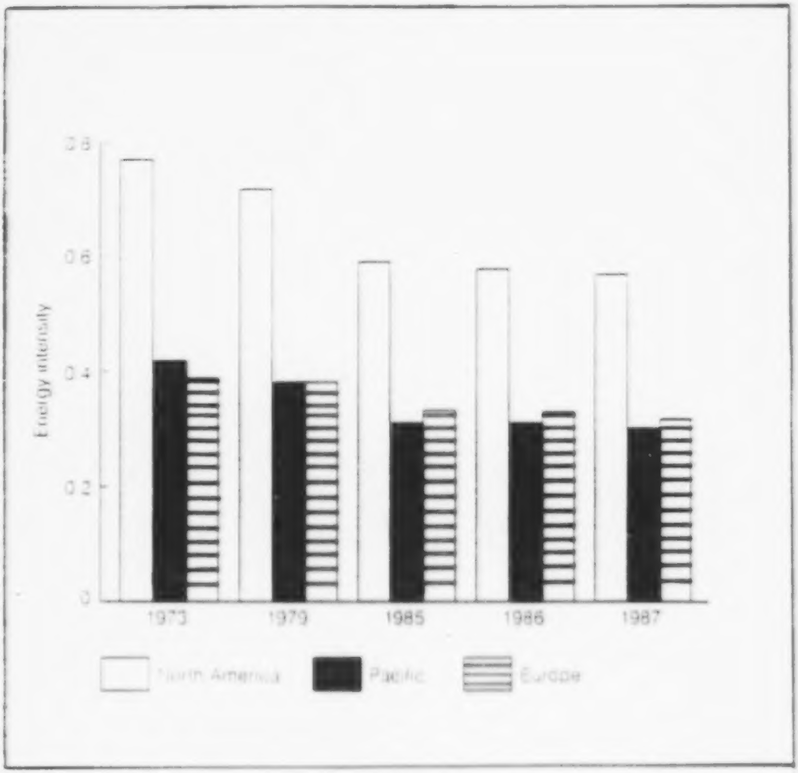
Figure 19 National Energy Intensities, 1987



Source: World Resources Institute, United Nations Environment Programme, United Nations Development Programme, *World Resources 1990-91* (Oxford University Press, New York, 1990).

Note: Includes fossil fuels and primary electricity (hydro, nuclear, and geothermal).

Figure 20 Trends in Energy Intensity in Developed Countries, 1973-87



Source: United Nations Environment Programme, *Environmental Data Report*, (Basil Blackwell, London, 1990), p. 408.

IN SEARCH OF THE GREENHOUSE FINGERPRINT

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The greenhouse effect appears to have sprung full-blown into the public consciousness in a remarkably short time. In fact, the notion itself first appeared in print over 160 years ago and has been forgotten and rediscovered by the scientific community at least four times. Thus, in addition to its significance as the most far-reaching environmental and societal issue we have yet faced, it provides a fascinating example of how science constantly refines itself through the interplay of theoretical ideas, observations and continual testing for consistency.

Questions and speculations about the origin and age of the earth and its myriad species were well-developed, by the first quarter of the nineteenth century, even though the scientific knowledge needed to address these issues specifically was largely unavailable. Climatology perhaps began when physicists became intrigued with the question of how the earth managed to maintain its relatively warm temperature. It was the great French mathematical physicist Jean Fourier who argued that the atmosphere acted like the glass of a greenhouse by letting in the visible rays and energy of the sun, but impeded the radiation of heat from the warm earth back into cold outerspace. Fourier missed the point that glass helps greenhouses stay warm mostly by keeping the warm solar-heated air within from mixing with the cooler air outdoors. Nevertheless, his misnomer has persisted, and planetary absorbtion of radiant heat is still commonly referred to as the greenhouse effect.

The realization that the bulk of the atmosphere, 99 percent of which consists of nitrogen and oxygen, absorbed none of the sun's rays nor the earth's radiant heat, was difficult to reconcile with Fourier's notion. It was found instead, that the job of absorbing radiant heat or infrared radiation as it came to be known, rested with trace amounts of water vapor and carbon dioxide. In 1896, the productive Swedish chemist, Svante Arrhenius, took the newly acquired data on the infrared absorbing properties of these two molecules, and combined it with the American, Samuel P. Langley's measurement of solar intensity to produce the first quantitative calculation of atmospheric warming. He correctly concluded that although their presence was minute, water and carbon dioxide molecules together absorbed enough infrared radiation to warm the earth by nearly 60 degrees F. Instead of being an icebound, frozen planet, earth had a climate amenable to the carbon-based biochemistry that has given rise to approximately ten million living species.

Not satisfied with merely establishing the correctness of this important insight, Arrhenius went on in his paper to address the question of what would happen if industrial societies continued to add carbon dioxide to the atmosphere through burning of fossil fuels such as coal, oil, natural gas and peat. After a rather detailed analysis, Arrhenius concluded that a doubling of atmospheric carbon dioxide would raise the average global temperature by an additional 10 degrees F (later revised to 7 degrees F). His calculations compare very favorably with the best current estimate of 3 to 8 degrees F which is based upon better data and more elaborate analysis. In other words, Arrhenius correctly deduced that increasing the amount of carbon dioxide in the atmosphere can turn the greenhouse into a "heat trap" as Norway's Prime Minister, ms. Gro Harlem Brundtland, recently termed this "overheating".

After Arrhenius, little additional discussion of the greenhouse issue appears to have taken place until a British engineer, G. D. Callendar, in 1938, carried out the first direct comparison between the measured growth of carbon dioxide in the atmosphere and long-term temperature records from 200 meteorological stations. Using improved data, he updated Arrhenius' calculation and showed that his estimated temperature rise of 0.5 degrees F per century was in good agreement with the measured value of 0.9 degrees F per century. The response to Callendar's paper following its presentation to the British Royal Society was highly skeptical of the proposed link between increased atmospheric carbon dioxide and global warming. Callendar was undaunted and moreover was optimistic that the added carbon dioxide was "likely to prove beneficial to mankind in several ways" was increased "mean temperature would be important at the northern margin of cultivation." He also felt that plant growth would improve with increased carbon dioxide in the atmosphere, and "In any case the return of the deadly glaciers should be delayed indefinitely."

Although sporadic measurements of atmospheric carbon dioxide had been made since 1870, it was not until 1958 that anyone thought to develop a continuous record to measure just how fast it was accumulating. Roger Revelle of the Scripps Oceanographic Institute in California teamed up with a young chemist, David Keeling, to measure carbon dioxide at a remote site far from human activity in order to determine what changes were occurring in the uncontaminated atmosphere. Keeling's continuous, thirty-year record of carbon dioxide at the Mauna Loa Observatory in Hawaii is one of the most striking sets of natural data ever observed.

Figure 1 displays a remarkable interplay between ecology and economics revealed in the carbon dioxide record. The annual oscillations reflect the processes of gas exchange of the entire northern hemisphere. During spring and summer, green plants convert more carbon dioxide into the sugars and cellulose than they require for their own metabolism, and atmospheric levels of carbon dioxide decrease. During the fall and winter, when many trees lose their leaves, more carbon dioxide is released than is incorporated into plants and atmospheric levels increase. That is the ecological side of the story. Superimposed upon these annual oscillations is an inexorable rise in carbon dioxide levels that reflects the economic activity of human societies. The burning of fossil fuels is responsible for most of the carbon entering the atmosphere, some 5.9 billion tons each year, or one ton for each person living on the planet. During the past two decades, George Woodwell at the Woods Hole Research Center has established that deforestation, especially in the tropics is the other major contributor of carbon dioxide to the atmosphere, adding approximately one-fifth to the annual increase.

Extrapolating these data backward, it is estimated that we have seen a 25 percent increase in atmospheric carbon dioxide since the beginning of the industrial revolution around 1800. Because of the accelerating rate of fuel use and deforestation, just over half of this increase has occurred since Keeling began his measurements. If current trends continue, with atmospheric carbon dioxide increasing by 0.4 percent per year, the doubling of preindustrial levels will occur around 2075.

During the 1970s, attention was focused on atmospheric problems such as urban air pollution and the depletion of the stratospheric ozone layer that seemed unrelated to the global warming. It was only a decade later that their significance for the greenhouse effect would be fully recognized. An atmospheric scientist at the University of Chicago, Veerabhadran Ramanathan, first pointed out in the mid-1970s that the chlorofluorocarbons (CFCs), confirmed as stratospheric ozone depleters, shared with carbon dioxide the radiant-heat-absorption properties that cause global warming. His initial claim went largely unnoticed because the concentration of carbon dioxide was 500,000 times greater than that of CFCs; it was thought that CFCs would have only a negligible effect on global warming. Over the next ten years, Ramanathan and Ralph Cicerone of the National Center for Atmospheric Research at Boulder, Colorado, showed that each CFC molecule produced a warming effect nearly 20,000 times that of an added molecule of carbon dioxide. Moreover, measurements revealed that the additions of these commercial chemicals to the atmosphere were increasing at ten times the carbon dioxide growth rate. These researchers further demonstrated that methane, nitrous oxide and ozone formed in the photochemical smog of urban air pollution was also greenhouse gases that were accumulating rapidly in the atmosphere.

Their findings have startling implications. These additional gases now contribute as much to global warming as does carbon dioxide. Projecting into the future, the combination of growth in all of the greenhouse gases means that the warming predicted to result from a doubling of carbon dioxide alone in 2075 will occur as early as 2030. This is well within the lifetime of many people living today.

But has the earth warmed? In some locations, temperatures have been recorded continually for over 100 years. Two research groups, one in England under Thomas Wigley and a second in the United States under James Hansen, have analyzed millions of individual measurements from all over the globe. They have had to exercise great care, since not all data are equally reliable, and higher urban temperatures must be corrected for the local heat islands created by the concentrated release of energy from cars and buildings. After carefully evaluating all of such factors, both groups independently concluded that there has been a rise of about one degree Fahrenheit during the past century, and that nearly half of that rise has occurred since 1965 (**See Figure 2**). Hansen caused a major stir in June of 1988, when he testified before Congress that, based upon a statistical analysis of the data, there was a 99 percent certainty that the recent increases lay outside the range of normal temperature fluctuations. In other words, the earth's climate, which is defined as the thirty-year average of temperature (and weather), may be changing.

At this point it is important to ask a question: is the observed temperature rise caused by the buildup of greenhouse gases? The answer is a resounding "maybe." It is enormously difficult to prove cause and effect, especially when they are separated in time and linked by a complex set of interactions. It is even more difficult to convince policymakers and the public of the connection, when many of the measurements and the theory linking them are known only to a relatively small group of scientists. Just remember how hard it was to convince governments and industry that the benign chemicals (CFCs) used to operate our refrigerators, and air conditioners, to provide us with insulation and foam for our mattresses and chairs, and to keep our computers and communications systems functioning, were the cause of ozone loss in the stratosphere. Researchers assembled many pieces of evidence over more than a decade to persuade governments that a problem existed, and it required the discovery of the Antarctic ozone hole to capture the attention of the world. We cannot afford to wait for a similar event to dramatize the danger of greenhouse gases. By the time the greenhouse effect is noticeable to the person on the street, we will have committed ourselves to substantial additional warming that will take many decades to reverse.

What is clearly needed is a greenhouse early warning system. To develop such a system we must determine what additional consequences are expected to arise from global warming. We could then search for a pattern of such events, which would define a kind of "greenhouse warming fingerprint." We must build a plausible case based upon a collection of factors, no one of which may be convincing by itself, but when taken together provide a framework for judging whether or not our atmosphere has become a heat trap.

Two principal elements are already in place. The first is the direct observation of an increase in greenhouse gases, and the second is the measured rise in temperature by about the amount predicted by theory. We know, however, that there is uncertainty in the earlier measurements, and no one has a complete explanation for the leveling and slight decline in temperatures that occurred between 1940 and 1965. The four warmest years in the last 110 were recorded in the 1980s, with the first seven months of 1988 breaking all records. Whereas climatologists have defined one-third of the summer days between 1951 and 1980 as hotter than normal, recent records suggest that in the 1990s we can expect two-thirds of summer days to fall in that category. Does this prove that we are in a greenhouse warming trend? If 1989 is cooler, does that mean that the warming trend is over? The answer to both questions is probably not. What else can we look for?

The greenhouse theory predicts that we will see a nonuniform warming of the globe, with greater temperature increases at the poles, since heat flows spontaneously from the large warm equatorial regions to the smaller, cold polar areas. Also, as warming occurs one would expect melting of highly reflective ice and snow and greater heat absorption by the newly exposed darker land and water. While there are relatively few long-term temperature data from the polar regions, indirect information suggests that permafrost in some areas may have warmed up by as much as 7 degrees F, substantially more than the global averages, during the past century. The observed warming does have the general latitudinal distribution predicted by theory, but differs in several important details. Certainly we should carefully observe the distribution of warming and pay special attention to high and low latitudes, where larger, more easily observed increases in temperature are likely. Another clue we should search for in the greenhouse fingerprint is the poleward migration of animal and plant species, and the loss of heat-intolerant species near the warmer margin of their range. Similarly, it is anticipated that warming will vary with altitude above the earth in a manner that depends on the distribution of greenhouse gases.

A highly likely outcome of global warming is a rise in sea levels, not only because water expands as it warms, but also because of added volume from the melting of snow and glaciers on land. In fact, records show that sea level is currently rising at a rate of a bit more than one-half an inch per decade. If greenhouse warming is occurring, this rate can be expected to accelerate to the point where sea level could be one to four feet higher by 2050. Because there is a lag before the effects of atmospheric warming are fully realized, continued additions of greenhouse gases at the present rate will have committed the earth as early as 2030 to this increase in sea level rise. Coastal areas will be seriously affected. The United States is currently experiencing beach erosion along three-quarters of its coastline and can expect further losses. Research by Stephen Leatherman at the University of Maryland shows that barrier islands, which protect coasts, are especially vulnerable to sea level rises of this magnitude. Other researchers have warned of the potential loss of highly productive estuaries and coastal wetlands and the wildlife and marine fisheries which support. Saltwater intrusion into coastal urban groundwater supplies, as well as loss of valuable coastal buildings and damage to highways, sewage treatment plants and other infrastructure of coastal cities are also likely.

The largest and fastest computers in the world are now trying to model the complex relationships between the atmosphere and the oceans. Although it is exceedingly difficult to predict the detailed regional effects of the projected warming pattern on the weather, researchers foresee significant changes in precipitation and in the intensity and frequency of storm events. We know for certain that the temperature difference between the equator and the poles plays an important role in determining continental weather patterns. Most of the computer models predict that as this temperature difference decreases, precipitation will decline in the mid-continental regions and move toward the poles and the coasts. Sykuro Manabe of the National Oceanic and Atmospheric Administration laboratory at Princeton has developed extensive models that correlate soil moisture with temperature and he projects considerable drying for most of the important food growing regions of the world, including the United States grain belt. While the 1988 droughts in the United States and China are consistent with the models, it is not possible to link single-season events to the global warming. Droughts of this magnitude have occurred before, but they would have to happen with increasing frequency to be considered part of the greenhouse fingerprint. It will also be important to determine the extent to which desertification can be linked to global warming.

Scientists such as Stephen Schneider at the National Center for Atmospheric Research at Boulder, Colorado, are just beginning to try to model the effect of global warming on storm intensity and frequency. Because tropical storms such as hurricanes and typhoons derive their heat from the oceans, it seems reasonable that they should increase in intensity as the oceans warm. During the 1983 El Nino oscillation in the southern Pacific, the altered interaction between ocean currents and the atmosphere produced weather changes around the globe, including drought in Africa and Australia, changing monsoon patterns for the Indian subcontinent, and torrential flooding along the California coast.

Finally, there are uncertainties and possible complex interactions that the fertile minds of scientists have conjured up but have not yet placed within the context of the greenhouse fingerprint. For example, what function will clouds have in a warmer world? One would assume that more water would evaporate as the oceans heated up, producing more clouds that would reflect sunlight [illegible] should help reduce the warming. The [illegible] clouds is one of the great unknowns in predicting climate change associated with the buildup of greenhouse gases.

Among still other uncertainties is where nearly half the carbon dioxide that is released into the atmosphere goes. It is assumed that it dissolves in the ocean, but ocean circulation and the biological cycling of carbon are still not very well understood. We know even less about the sources of the rising amounts of atmospheric methane. Part of the increase appears to be related to our agricultural practices. Could some be arising from the warming itself, as anaerobic bacteria increase their metabolic activity or thawing tundra begins to release the vast stores of trapped methane? Are there surprises ahead for us like those that occurred with the Antarctic ozone hole? Walter Broecker at Columbia University has raised the possibility that changes may not be gradual, but sudden and discontinuous. He has suggested that ocean currents may suddenly shift (as happened in the El Nino event) in response to temperature changes. Were the Gulf Stream, for example, to shift south, we could witness the anomaly of a colder Europe in a warmer world.

Over time the range of uncertainty can be expected to narrow, as researchers obtain new information and refine and test their models. There are in fact two very important observations that help to put the greenhouse effect into a larger context.

The first came to light recently (1987), when a Soviet team drilled a deep ice core two thousand meters deep near its research station at Vostok, in Antarctica. French researchers cooperated in analyzing air samples trapped in the ice and determined their age. From isotope data it was then possible to estimate the global temperature at the time each sample was trapped. The findings are very intriguing. During the past 160,000 years, carbon dioxide levels have varied directly with temperature. During a very warm interglacial period 130,000 years ago, carbon dioxide levels were just under 300 parts per million. Levels dropped to around 200 parts per million during the last great ice age, then climbed to 280 parts per million as the world entered the current interglacial warm spell. In only 100 years we have reached 350 ppm, with more than half of this rise occurring in the past 30 years. It is not possible to determine from the ice core data whether increases in carbon dioxide levels cause or follow [illegible] the rate of change in temperature [illegible] greenhouse effect, is three to ten times faster than any change of which we have knowledge--and that by 2030 we may well have brought about temperatures higher than have occurred in 160 millennia.

The second critical natural greenhouse experiment has also been completed with unambiguous results. The atmosphere of our sister planet, Venus, is 98 percent carbon dioxide. Several probes from earth have traversed that atmosphere and reached the planet's surface, which lies beneath a heavy layer of clouds. Each of the probes was destroyed--not by hostile forces, but by the searing

800 degree F temperature of the Venusian heat trap. Even were we to burn all of our known fossil fuel reserves, increasing the carbon dioxide of our own atmosphere by five to tenfold, we would raise the concentration to only a few tenths of one percent. While this would increase the earth's temperature by several tens of degrees rather than the hundreds observed on Venus, relatively few species would be able to adapt to such a change. Instead of worrying that we might one day run out of fossil fuels, we might take a lesson from our sister planet and realize that we can not afford to burn all we have.

We must keep such lessons in mind as we conduct our own planet's greenhouse experiment. While we watch for an unambiguous greenhouse warming signal, we need to call on the knowledge we have to fashion a response. Learning to use fossil fuels twice as efficiently as we now do would put our economy and high standard of living on the same basis as Western Europe enjoys. This improved energy efficiency--combined with replacing coal with natural gas, which produces half the carbon dioxide per unit of energy, and rapidly reducing the use of CFCs during the next decade--would slow the rate of global warming while we develop solar and other noncarbon dioxide-producing energy technologies. These actions would place our society on a path of sustainable and environmentally sound economic development. It is essential that we begin this task immediately as the insurance we need, just in case the greenhouse fingerprint appears clearer and sooner than we expect.

Figure 1. The average atmospheric concentration of carbon dioxide in parts per million is plotted for each month between 1958 and 1986. The measurements were made in clean air at the Mauna Loa observatory in Hawaii and reveal both the annual oscillation in carbon dioxide and the rise in average concentration during this period.

Atmospheric CO_2 Variations 1958-1986

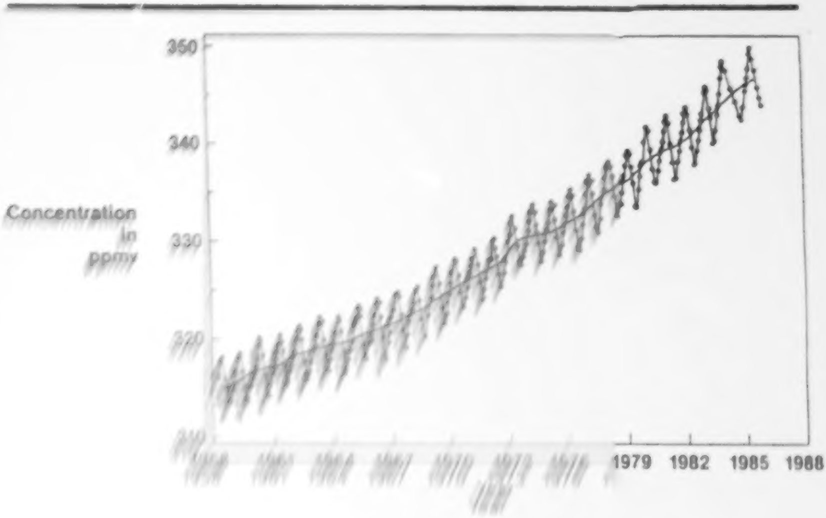
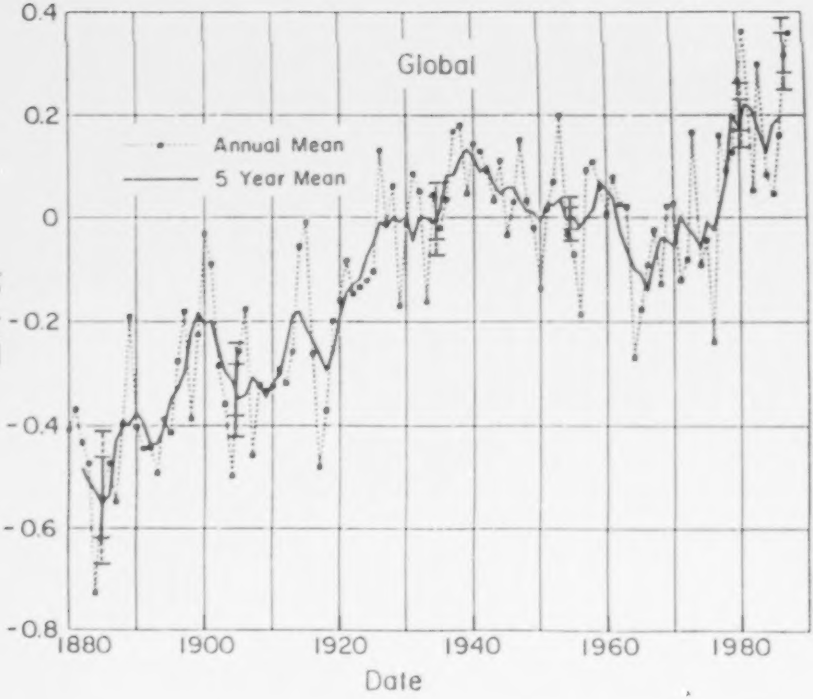


Figure 2. The annual change on the global temperature from the average of the reference period 1951-1980 is plotted for each year from 1860 through the first five months of 1988. Note the levelling that occurred between 1940 and 1960 and the sharp rise that has occurred since then. Data provided by James Hansen, NASA Goddard Institute for Space Studies.



POPULATION AND NATURAL RESOURCES

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A Global Presentation was made but a copy was not submitted in time for press. Please contact author for further information.

BIOLOGICAL DIVERSITY: WHAT WILL REMAIN FOR THE FUTURE?

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This is a time of extraordinary change in the relationship between people and the biological resources upon which our welfare depends. While human population and resource consumption grows rapidly, the rate of species loss--already the highest in the past 65 million years--grows still higher.[1] Human activities are diminishing the earth's capacity to support life at the same time that growth in population and consumption intensifies demands on the planet's resources. We are causing the impoverishment of the world's most fundamental capital stock--its genes, species, habitats and ecosystems.

This variety of life on earth is known as biological diversity. The concept of biological diversity encompasses virtually all of life; this breadth reflects the interrelatedness of genes, species, and ecosystems. Because genes are the components of species, and species are the components of ecosystems, altering the make-up of any level of this hierarchy can change the others.

Biodiversity's Importance

The importance of biological diversity can be easily seen from a utilitarian standpoint, but the ethical rationale for biodiversity conservation may be more significant. Although we increasingly view the survival of other life on earth to be something quite separate from our own existence, this dichotomous view which separates humanity from all other life is neither shared by all cultures, nor has a long history even in western thought. (The first use of the word "environment," for instance, was made in the 19th century.[2]) Humanity is not just a "steward" of nature, instead we are dependent upon the natural world and we have no moral right to cause the extinction of the other species with which we share the planet. From the standpoint of our relationship to other species on earth, and from the standpoint of our relationship to future human generations, we have a moral--as well as utilitarian--responsibility to maintain the planet's richness of species and genetic diversity.

Earth's various plants, animals and microorganisms provide the rice and fish we eat, the penicillin doctors use to save lives, the bamboo poles villagers use to build their houses, and other natural products. They also provide options for addressing future human needs, and invaluable aesthetic, spiritual, and educational benefits. Just as important, species provide more subtle benefits in the form of wide-ranging ecological services. Coastal wetland ecosystems formed from various plant and animal species remove pollutants from the water and provide the spawning and rearing habitat for commercially important fish and crustaceans. Similarly, forest ecosystems help regulate water discharge into rivers, which affects the frequency of floods and the availability of water during dry seasons. These and other ecosystems also influence local climatic conditions or, in the case of a forested area as large as Amazonia, even global climate. In a sense, species and ecosystems are integrated service networks and the parts need to be conserved to conserve the whole. Just as habitats and ecosystems must be maintained to conserve species, species must be conserved to maintain habitats and various ecological services.

Humanity has long recognized and utilized genetic diversity in the development of varieties of domesticated plants and animals for use in agriculture, forestry, animal husbandry, and aquaculture. In U.S. agriculture alone, crop-breeding programs drawing on genetic diversity add an estimated $1 billion annually to the value of production.[3] Another way farmers take advantage of genetic diversity is by planting numerous varieties of crops as a hedge against total crop failure. By planting several varieties of potatoes, for example, Andean farmers can count on a successful harvest almost regardless of what turns the weather takes.

The fundamental social, ethical, cultural, and economic values of biological diversity have long been recognized in religion, art, and literature. The great interest of children in nature, the numerous wildlife clubs, the generous donations made to conservation organizations, the political support for "Green Parties," and the popularity of zoos and wildlife films are economic expressions of preference and show that the general public does not think of biological resources merely in terms of a cash value.

Nevertheless, policies that promote conservation can better compete for the attention of government and commercial decision-makers in today's world if they demonstrate the economic contribution that species and genetic resources make to development. Even partial valuation of the benefits of conserving biological resources--the portion of biodiversity of actual or potential value to humanity--can provide at least a lower limit to the full range of benefits that conservation can contribute to national economic development. Such methods of valuation reveal that biological resources confer much larger economic benefits than is typically appreciated.

For instance, Christine and Robert Prescott-Allen, in a ground-breaking study that showed how to estimate the dollar value of biological resources, analyzed the contribution of wild plant and animal species to the U.S. economy and concluded that some 4.5 percent of GDP (some $87 billion dollars per year in the late 1970s) is attributable to wild species.[4] In Canada, some 84 percent of the population participates in wildlife-related recreational activities, providing Canadians with benefits that they declare to be worth $800 million annually.[5] In Sarawak, Malaysia, a detailed field study found that wild pigs harvested by hunters had a market value of some $100 million per year.[6] Other values can be calculated for resources that are commercially harvested and traded on markets.

Still other biological resources may provide indirect values through their role in ecosystem functioning. For example, the value of retaining a wetlands complex outside of Boston, Massachusetts, amounted to an annual savings of $17 million in flood protection alone (a figure that did not include the many other benefits--such as sediment reduction, fish and wildlife production, and aesthetic values--that the wetlands afforded area residents).[7] In Thailand, the $1.5 million cost of protecting the watershed of the Nam Pong Reservoir is more than justified by the lessened rate of siltation of the reservoir.[8] The maintenance of large relatively intact ecosystems also has implications for regional and global environmental conditions. In the absence of the forest cover of Amazonia, computer models predict that rainfall would decrease significantly in the region,[9] and the loss of the carbon sink of the forest could significantly increase the rate of climate change.

Already enormous, the value of biological resources to humans will grow alongside environmental degradation. Diversity in genes, species, and ecosystems provides the raw materials with which human communities will adapt to change. The loss of each additional species reduces the options for nature--and people--to adapt to our changing environment.

Human beings have used about five thousand species of plants as food, but only 150 or so have entered world commerce and less than twenty provide most of the world's food.[10] Just three crops--wheat, rice, and maize--account for roughly 60 percent of the calories and 56 percent of the protein that humans consume directly from plants.[11] Yet numerous other species have considerable potential, particularly in rural areas. Numerous locally important species of wild and domesticated plants could be cultivated and used much more widely.[12] For example, quinua, a staple grain of the ancient Incas, is little known outside of the highlands of Bolivia, Chile, Ecuador, and Peru, yet it is one of the world's most productive sources of plant protein.[13] Its more widespread use in tropical countries could significantly increase grain productivity and help alleviate the pressures forcing continuing agricultural expansion onto marginal lands.

Similarly, some 25 percent of western medicines are still derived from natural products and about four-fifths of the people in developing countries still rely on traditional medicines for health care.[14] Natural products will remain important in the search for new pharmaceuticals. One potential drug for use against the HIV virus is derived from the seed of an Australian rain forest tree (Castanospermum). Similarly, a compound that is proving active against malaria is derived from a Chinese herbal medicine (Qinghaosu).

The conservation of biodiversity is an important objective for all nations, individually and collectively, and for local communities. The variety of species and genes found in a nation, and the habitats and ecosystems in which they occur, are critical resources that should be utilized sustainably in each country's development. Whether or not a country is species-rich, the management of the human use of the nation's biological diversity should be a national priority to ensure that people's needs are met and that the nation's global responsibility is fulfilled.

Where is the World's Biodiversity Located?

Some 230 years after Linnaeus began classifying the variety of life on earth, we still do not know how many species exist--even to within a factor of ten. Of the estimated 10 million to 30 million species on earth, only some 1.4 million have been named and at least briefly described.[15]

Our incomplete knowledge of the distribution and diversity of species is particularly striking for certain groups of organisms, such as insects. For example, in a recent survey of just 19 trees in a tropical forest in Panama, fully 80 percent of the more than 950 species of beetles found are believed to be previously unknown to scientists.[16] More detailed studies of tropical insects are now expected to reveal millions of new species, perhaps even tens of millions. Moreover, nearly every animal species may be host to at least one specialized parasitic species, only a small fraction of which have been described. Even tropical vertebrates are far from fully described. An estimated 40 percent of all freshwater fishes in South America have not yet been classified.[17] The deep sea floor is a similarly unstudied region that is proving to be extremely species rich, containing as many as a million undescribed species.[18]

For most well-studied groups of organisms, species richness increases from the poles to the equator. Forty to one hundred species of trees may occur on one hectare of tropical rain forest in Latin America, compared to only ten to thirty on a hectare of forest in eastern North America. Global patterns of species diversity in the marine environment resemble those on land. On Australia's Great Barrier Reef, for example, the number of genera of coral increases from less than ten at the southern end to more than fifty at the northern end.[19]

The "rarity" of species also varies geographically. Rare species are particularly susceptible to extinction when their limited habitat is disturbed or lost. Species restricted to small ranges, known as "locally endemic species" often occur on mountains, islands, peninsulas and in other areas where dispersal may be restricted by geography, or where unique local conditions lead to the evolution of species suited to that specific environment. For instance, regions with Mediterranean climates including California, South Africa, Chile, and Southwest Australia have a high percentage of locally endemic plant species. Certain islands have even higher percentages of locally endemic species than Mediterranean zones do. Remote oceanic islands--such as Hawaii and Ascension--have the world's most distinctive floras: only a small percentage of the native species on these islands are found anywhere else. For example, 91 percent of the 956 flowering plants native to the Hawaiian Islands are endemic to the islands.[20]

Islands with both high species richness and highly distinctive floras are among the most critically important sites for conserving biodiversity. Approximately 80 percent of the nearly 8,000 vascular plant species of Madagascar are found nowhere else, 90 percent of the approximately 9,000 flowering plants of New Guinea are endemic to that island, and 76 percent of New Caledonia's 3,250 vascular plants exist only on New Caledonia.[21]

Maintaining the highest number of species without considering their taxonomic position makes little sense, as a comparison of marine and terrestrial environments shows. Terrestrial environments contain at least 80 percent of the world's total species, mainly because plants and insects are so numerous on land--accounting for nearly 72 percent of all described species in the world--and so poorly represented in marine environments. However, the sea has far greater diversity of higher taxonomic groupings of organisms, known as classes and phyla. The sea contains fully 90 percent of all classes and phyla of animals.[22]

How Serious is the Threat to Biological Diversity?

If current trends continue, extinctions in the coming decades may represent the most massive loss of species since the end of the Cretaceous era, some 65 million years ago. Since 1600, one percent of birds and two percent of mammals are known to have gone extinct, and the unrecorded extinctions probably far exceed these figures. (**See Figure 1**) Already, the rate of extinction of birds and mammals may be as much as 100 to 1000 times the background extinction rate. The single greatest cause of species extinction in the next half-century will be tropical deforestation. Scientists concur that roughly 5 to 10 percent of closed tropical forest species will become extinct per decade at current rates of tropical forest loss and disturbance.[23] With more than 50 percent of species occurring in closed tropical forests and a total of roughly 10 million species on earth, this amounts to the phenomenal extinction rate of more than 100 species per day. Globally, roughly 5 percent of the world's species will be lost per decade if current trends continue.[24]

The extinction crisis is not restricted to tropical forests. Freshwater habitats are being dramatically altered as rivers are impounded and exotic species introduced. In the southeastern United States, for instance, 40 to 50 percent of freshwater snails have been driven to or near extinction as water impoundments were built and rivers straightened, widened, and deepened. Oceanic islands, where most extinctions have occurred in past centuries, also remain among the most threatened ecosystems on earth. Some 60 percent of the plant species endemic to the Galapagos islands are threatened with extinction, as are 40 percent of Hawaii's endemic species and 75 percent of the endemic plant species of the Canary Islands. Mediterranean climate zones, with their high plant species richness and distinctive floras, face continuing threats of species loss through habitat conversion and species introductions.

Habitat loss and degradation are the most important causes of the extinction crisis, but overharvesting, species introductions, pollution, and other causes also take a significant toll. Global warming will exacerbate the loss and degradation of biodiversity by increasing the rate of species extinction, changing population sizes and species distributions, modifying the composition of habitats and ecosystems, and altering their geographical extent. Even if all human impacts on the biosphere were to cease immediately, species extinctions due to the impacts that have already taken place would continue for decades.

Genetic diversity, an invaluable tool used by farmers since the dawn of agriculture, faces extinction threats just as great as those to species. Wild relatives of economically important crops, trees, and livestock--often carrying unique genes that can be used to breed resistance to pests or to improve yields--are disappearing, and crop cultivars that farmers have planted for centuries are being replaced with high-yielding varieties. Seed and germplasm banks have been established and expanded in the past two decades to deal with the threats to genetic diversity, but significant problems and gaps remain. For example, nearly half of the two million accessions currently stored in gene banks have not been described. Moreover, while crops of global importance--such as rice and wheat--are well represented in seed banks, such regionally important crops as cassava are not.

Where does the blame for the loss of biodiversity and the degradation of biological resources lie? On the surface, the answer seems clear. The proximate causes include large-scale clearing and burning of forests, overharvesting of plants and animals, indiscriminate use of pesticides, draining and filling of wetlands, destructive fishing practices, air pollution, and the conversion of wildlands to agricultural and urban uses.

But the root causes of biodiversity's loss are found in basic economic, demographic, and political trends. These root causes include demands for commodities such as tropical hardwoods, wildlife, fiber, and agricultural products. The growing human population, even without proportional economic growth, places increasing demands on natural resources and ecosystem processes that are already impoverished and stressed. Settlement policies promote the movement of the growing unemployed labor forces to frontier zones. The debt burden forces governments to encourage the production of commodities that can earn foreign exchange. Energy policies encourage inefficiency in many nations, and in so doing add to the burden of air pollutants and the risk of substantial global climate change. Inappropriate land tenure arrangements discourage rural people from investing in sustainable agricultural practices.

When the problem of biodiversity loss is defined in terms of its immediate causes, the response is to take defensive and often confrontational actions, such as enacting laws, closing access to resources, and declaring additional protected areas. Such responses are necessary in times of rampant over-exploitation, but they are seldom really sufficient to change underlying social and economic causes. Defining the problem in terms of its root causes can stimulate a more constructive response that seeks cooperative efforts to address the social and economic foundations of resource depletion.

What Can Be Done?

Considering the magnitude of the threat to the world's biodiversity and the tool that the degradation of biological resources takes on individuals and development efforts, quick action is needed to halt the loss of biodiversity. Such action must address many of the root political, social, and economic causes of the loss and degradation of biological diversity, but it must also be informed by the biological sciences.

The response of developing countries to the threat of biological impoverishment is particularly constrained by pressing social and economic issues and by the burden of international debt. Many actions that can be taken to stem the loss of biodiversity do provide short-term economic benefits--say, maintaining natural forests so that wild species can be harvested for food, medicines, and industrial products or establishing protected areas so that tourists will visit or downstream water development projects won't clog with silt. But the long-term conservation actions needed will not be taken in the developing world unless developed countries provide their fair share of the funds, technology and knowledge needed to implement them. It is in all countries' interest to share responsibility for conserving biodiversity.

Conservation will only succeed if both proximate and ultimate causes are addressed. The complex threats to biological diversity call for a wide range of responses across a large number of private and public sectors, and the mix of these responses must be adjusted to local conditions. Since government policies are often responsible for depleting biological resources, it stands to reason that policy changes are often a necessary first step toward conservation. National policies that deal directly with wildlands management or forestry, or that influence resource use indirectly through land tenure, rural development, family planning, and subsidies for food, pesticides, or energy can have significant impacts on the conservation of biodiversity. National and sub-national conservation strategies can often provide the mechanism for identifying the changes that are necessary.

People form the foundation for the sustainable use of biological resources. Indeed, initiatives that do not involve local communities generally are doomed to fail. In particular, indigenous people in many parts of the world are especially reliant on natural resources for their cultural continuity and economic well-being. Their role in conservation should be given particular attention and they should be given opportunities to participate as major players in the design of conservation programs affecting their resources. Local people should be closely associated with the authorities responsible for the management of biological resources and for the establishment and management of protected areas.

Scientists now know enough about the distribution of biological diversity, the threats that it faces, and the conservation tools available to maintain it so that current conservation efforts could be expanded considerably without fear of wasting effort or money. But important remaining gaps in knowledge will continue to hinder conservation and limit the benefits that biological resources can provide to humanity. Specifically, inventory and systematic research must be accelerated, greater support must be given to the study of conservation biology and community and ecosystem ecology. And restoration and rehabilitation techniques must be enhanced in line with the growing need for their application.

A variety of tools, including both in situ and ex situ techniques, play critical roles in the conservation of biodiversity. In situ preservation of genes, species, and habitats ensures the maintenance of areas in a natural or semi-natural state. Protected areas--ranging from strict nature reserves to multipurpose extractive reserves where harvesting of timber, grazing, or hunting form part of reserve management--can both maintain biodiversity and provide jobs and resource-based products. Dedicating a relatively small portion of the earth's land surface to protected areas can save a substantial fraction of the world's species diversity. Furthermore, wild relatives and local varieties of crops and livestock can be protected through the combination of protected areas and carefully managed agricultural and forest land. _In situ_ conservation of species important in agriculture ensures the maintenance of both the genetic material and the farming system with which it has evolved and allows crop and livestock varieties to continue to adapt to such changing environmental conditions as increases in pest population or temperature.

Protecting habitats is the best way to protect species, and most national governments have established legal means for such habitat protection. These include national parks and other types of reserves (some [illegible] major reserves exist, covering nearly [illegible] million hectares); local laws protecting particular forests, reefs, or wetlands; restrictions on private land-use (easements); zoning regulations; and customary law protecting sacred groves or other special sites. The responsibility for management of protected habitats is often spread widely among public and private institutions. While accomplishments to date are impressive, the amount of habitat protected must be increased by a factor of three if these areas are to make the necessary contribution to conserving biological diversity. Many of these new areas will need more flexible approaches to management than is usual in national parks.

Protected areas will succeed in realizing their conservation objectives only to the extent that the areas themselves are effectively managed, and to the extent that the management of the land surrounding them is compatible with the objectives of the protected areas. This will typically involve protected areas becoming parts of larger regional schemes to ensure biological and social sustainability, and to ensure that benefits reach the rural population and that the rural population is involved in policy decisions related to the protected areas.

Besides contributing to public education and basic research, _ex situ_ conservation complements _in situ_ techniques, so the two must be closely coordinated in both natural and human-altered ecosystems. Zoos, aquaria, and

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botanic gardens are already playing significant roles in biodiversity conservation, further research and greater financial commitment to their activities would enhance their utility. Ex situ preservation of agricultural genetic diversity through seed banks and other techniques affords breeders ready access to a wide range of genetic materials and may be a precious last resort for many species and varieties that would otherwise become extinct as modern varieties replace them. The utility of ex situ conservation of genetic resources can be strengthened by fortifying efforts to conserve and maintain the genetic diversity of crops important in tropical countries, the wild relatives of economically important species (particularly using in situ techniques), the genetic diversity of important forestry species, livestock's genetic diversity, and knowledge of the farming systems in which local crop and livestock varieties evolved.

Curbing the pollution of the biosphere is the biggest and most expensive conservation measure. Biological diversity is threatened by various forms of chemical pollution, but ultimately the gravest threat may be global climate change. Mean world temperatures could increase by about 3 degrees C in the next 50 years with an attendant rise in sea level of [illegible] centimeters. While the species and ecosystems contained within protected areas will certainly be affected by climate change, it is unrealistic to expect the boundaries of existing protected areas to be substantially changed to track the changing climate because they are usually surrounded by more intensive human land uses. Instead, new forms of intervention will be required to maintain systems deemed desirable.

The cost of necessary actions to conserve biological diversity is high. The cost of not addressing the biodiversity crisis is, of course, greater still, but it will not appear on current national income accounts. Instead, it will be paid by future generations.

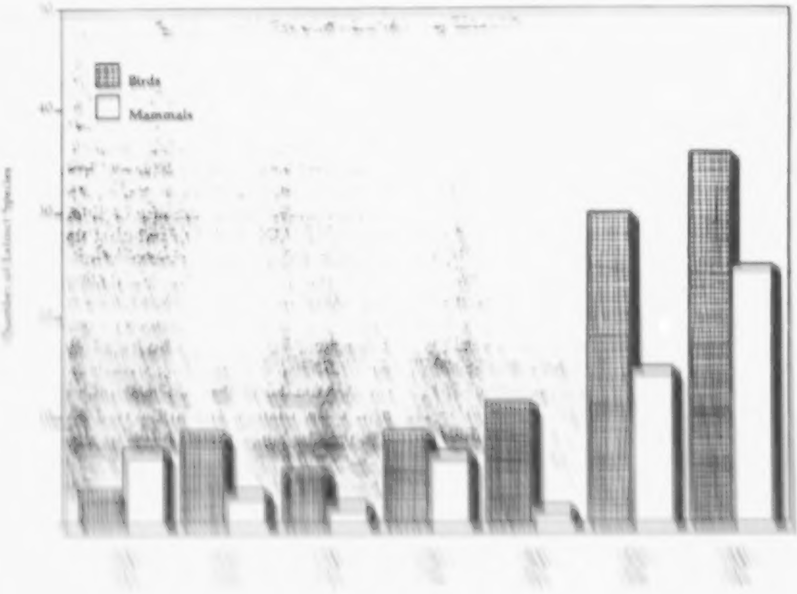

Figure 11. Number of species of birds and mammals that became extinct between 1800 and 1950.

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THE ENVIRONMENT/DEVELOPMENT CONNECTION
OR
THE CRITICAL IMPORTANCE OF THE DEVELOPING COUNTRIES FOR THE SUSTAINABILITY OF GLOBAL SYSTEMS

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U.S. foreign policy, dominated for more than a generation by the "soviet menace", failed to recognize other significant world trends. When policymakers looked at the developing countries of Latin America, Asia and Africa during the Cold War period, they perceived them primarily as troubled and poor--vulnerable to revolution. They did not see the trends that made them potential trouble for themselves and for the rest of the world--rapid population growth, sharply accelerated economic activity and resource use, pollution of water and air, deforestation and soil loss, and global warming.

With the failure of the centralized economies and the detente between the United States and the Soviet Union, the resurgence of the European Community and the astonishing rise of Japan, world affairs are in flux. There are great hopes for an era of democracy and freedom and even the promise of financial resources being freed up to spend on human problems and natural systems. But so far, policies haven't changed much; the machinery of State is slow and barely responsive. Indeed, the United States seems sometimes to be dragging its heels on international environmental matters and barely cognizant of the importance of developing countries and the environment and development trends of interest to American citizens. So let me review those environment/development connections, the relation between poverty and environmental degradation and the reasons why U.S. policymakers should care.

The Cost of Environmental Degradation in Developing Countries[1]

The consequences of poor resource management manifest themselves differently in different countries. But whatever the variations, the impacts will eventually be economic. For example, demand for household fuel clearly threatens economic development. It has denuded forests near rural villages and around cities. With the loss of tree cover comes increased erosion and reduced crop yields. Where scarce fuelwood is replaced by dried dung--an estimated 400 million tons annually--the soil is robbed of natural replenishment. Soil fertility then falls, reducing harvests by an estimated 14 million tons of grain a year, more than all food aid from all donors to all developing nations.

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[1] The first three sections of this paper are drawn from Chapter 1 of Janet Welsh Brown, Ed., In the U.S. Interest: Resources, Growth and Security in the Developing World (Boulder, Colorado: Westview Press, 1990).

Throughout the developing world, deforestation proceeds apace. Between 40 and 50 million acres of tropical forests, an area roughly the size of Washington State, is lost to non-forest uses each year. Even more is damaged. Fuelwood shortages now affect an estimated 1.5 billion people in 63 countries. Of the 33 countries currently exporting industrial wood products, 23 will probably become importers of forest products by the year 2000. Most forest loss comes from permanent conversion of forest to agriculture, but commercial logging, cattle ranches, and peasant use of the trees for fuel and fodder all eat away at remaining natural forest. Each year, runoff from 160 million hectares of degraded upland watersheds contributes to soil erosion, declines in agricultural productivity, downstream silting and flooding, and destruction of fishing grounds.

For some countries with mounting oil-import bills, hydroelectricity is the most promising means of providing power for industrial and residential users, and often water for irrigation as well. But environmental neglect can stifle the promise through siltation. The loss of electric output from the silt behind hydroelectric installations runs into the billions of dollars. In the Dominican Republic, for example, siltation has already cost the large Tavera Dam, completed in 1973, more than 40 percent of its dead storage capacity and 10-14 percent of its active storage. In Colombia, the Anchicaya Dam lost 25 percent of its storage capacity in just two years. In China, The Sanmenxia Dam silted up totally within four years of completion.

The environmental, health, and other costs of hydroelectric dams can be high. The United Nations Food and Agriculture Organization (FAO) estimates that, worldwide, 20 percent of all irrigated lands are waterlogged, excessively saline, or both, which means additional costs in lowered agricultural productivity. In Egypt, 30-40 percent of the irrigated land is affected by salinization; in Syria, 30-35 percent; in India, 27 percent. Health costs for treating malaria and schistosomiasis often climb drastically after dam construction because the mosquitos and snails that carry these diseases proliferate in the standing waters of irrigation canals. Egypt spends more than $500 million a year treating and preventing schistosomiasis. Harder to quantify, but nonetheless real, are the dislocation and losses to people (often tribal groups or extremely poor peasants) whose lands are flooded over, and of species that die out when tropical forests and free-flowing streams are submerged.

Clean drinking water is also in short supply, and shortages take a high toll in health costs. Throughout the developing world, water polluted by sewage and industrial wastes causes disease and death. In India, for example, 70 percent of all surface waters are polluted. As the Yamuna River flows through Delhi, it daily picks up a staggering 200 million liters of raw sewage and 20 million liters of industrial wastes, including 500,000 liters of "DDT wastes." Eighty percent of childhood deaths in developing countries are due to diarrhea, worm infestation, and other waterborne diseases. By 1985, despite the considerable efforts launched under the United Nations Decade of Water Supply and Sanitation, only about half of the urban populations had adequate water supplies and sanitation. Percentages for rural people were much lower. Once groundwater is contaminated it can take decades, even centuries, before natural processes purify it. In a fundamental sense, health, too, is an environmental matter in developing countries.

World pesticide sales grew from $2.7 billion in 1970 to $11.6 billion in 1980. They were expected to reach $18.5 billion by 1990, with the most rapid growth occurring in developing countries, as consumption in the United States and other industrialized countries levels off. Developing country use includes many compounds that have been banned in industrial countries. The costs in human life, health care, and agricultural losses due to pesticides and pest resistance are also rising. Some 10,000 people die each year and 400,000 suffer acute effects from pesticide poisoning, while the number of pesticide-resistant insect and mite species is growing (from 25 in 1974 to 432 in 1980).

Soil loss everywhere undermines agricultural production, but the loss is especially worrisome in the developing countries, where food production often cannot keep up with population growth and food imports can drain national budgets. No part of the developing world has been spared. In Guatemala, 40 percent of the land's productive capacity has been lost to erosion and some areas of the country have been abandoned because agriculture is no longer economic. In Turkey, an estimated 75 percent of the land is affected, 54 percent severely so. In India, 13 million hectares are eroded by wind and 74 million by water--equal to one-quarter of the country's land. Throughout Africa, overgrazing, overfarming, and overcutting--all pushed by rapidly growing populations--have so reduced land productivity that nearly a score of countries are prey to famine whenever the rains fail. In much of Haiti, topsoil is virtually gone. The costs, though enormous, are hard to calculate, partly because they occur so far from the eroding field or hillside. In the United States, though, the annual costs of off-site erosion from damage to marine resources, loss of hydroelectric capacity, and dredging requirements are estimated at $6 billion.

Each year, 6 million hectares of drylands are added to the 1.3 billion hectares that by 1984 had already been severely degraded. In 1984, the FAO predicted that, without conservation measures, the total area of rainfed cropland in developing countries will shrink by 18 percent (544 million hectares) because of soil erosion, salinization, depletion of nutrients and organic matter, pollution, and deterioration of soil structure. In the same period, another billion people will be added to the world's population, more than 90 percent of whom will be born in developing countries.

Environmental degradation and growing populations together can undo the gains of national development, as a look at specific countries shows. Egypt, for instance, has already lost the struggle to meet its rapidly growing population's food needs. Despite substantial gains in food production over the last 20 years, per capita output has declined. The wildfire growth of Cairo (10 million residents, and still growing) and other urban areas, most of them along the fertile shores of the Nile River, encroaches steadily on farmland. New industries also take their share. government policies favor cotton and other commercial export crops, and further reduce the areas left for growing food. At the same time, desert sand from the west encroaches on fertile soils at several places along the Nile valley. Soil along the Nile itself is eroding much faster than it did before the construction of the Aswan Dam. Increased soil salinity, the result of poor irrigation practices, threatens most of the irrigated lands and reduces productivity further. The charge for all this against Egypt's development hopes is staggering: wheat and flour imports cost the government about $1 billion a year. Total annual earnings from Suez Canal fees barely pay for sugar imports.

In Central America, nations launched ambitious development programs in the 1960s and 1970s to raise their standard of living and bolster their economic independence. Although country-to-country differences were marked, all based their development strategies on agricultural exports and industrial development aimed at import substitution. Only a handful of industries have succeeded, and the debt assumed in the process is today the single largest impediment to growth. The production of export crops--principally coffee, bananas, sugar, cotton, and cattle--was modernized with deep-pocket investments in mechanization, pesticides and fertilizers. Throughout the region, farmers who rented or farmed small plots without title were divested of their land to make room for the export crops. For some years, these crops accounted for half to two-thirds of export earnings in El Salvador, Honduras and Guatemala, but intensive monocultures have degraded the resource base, and the shift in land use caused a decline in food production. In the Costa Rican lowlands, for instance, small-scale agriculture virtually disappeared as a result of the banana plantations in the 1960s, while corn production declined 87 percent in six years. In Nicaragua in the same years, huge sales to Japan made cotton the leading export.

Each of these agricultural activities has had its environmental costs, but deforestation for cattle ranching has caused the most destruction. From 1960 to 1980, Central American forests declined from 60 percent to 40 percent of the territory--with two-thirds of the cultivated land in livestock. Since 1963 the World Bank has lent funds for cattle ranching to every Central American country except El Salvador and has provided more credit for livestock than for any other kind of agricultural activity. The Inter-American Development Bank also recognized cattle production as "highly suited" to the region and looked to it as a promising earner of much-needed foreign exchange. But the planners did not understand that the luxuriance of the tropical forests is deceptive, hiding nutrient-poor soils unsuited to cattle raising. The amount of land needed to support one animal quickly rose from one hectare, in the first years of production, to five to seven hectares. After 10 years or less, cattle ranchers must often move on to new forest lands to support their herds.

Today, the highest rate of deforestation in the hemisphere is in Central America. Fuelwood is already in short supply, and some countries will be forced to import lumber in a few years. Dams and rivers silt up faster than expected as soil is carried off.

Central America's development strategy exacted a high price: debt for the state, and concentration of agricultural land in fewer hands, and even greater poverty for the landless. And the land, the region's chief natural resource, has been used in a profligate manner without visible return. Far from fostering economic independence, the past generation's development strategy has left Central America more dependent than ever on the United States and the rest of the industrialized world.

Poverty and Environmental Degradation

Even as the land deteriorates, the world's population grows, more rapidly than ever. As Fran Spivey-Weber has demonstrated in her paper on population and environment, the world's population has doubled since World War II, and we'll add another 1.2 billion (a 24% increase) between 1987 and 2000. More than 90% of the births will be in the developing countries. The poorest of them live in the rural areas, but in most continents now, the largest numbers of poor live in the unbelievably crowded cities. Their numbers put heavy demands on the land and the forests, on water supplies and sanitation and on every kind of public service. Education, health services, agricultural productivity, forests and soils, already stressed in many countries, will feel the increased demands of another billion human beings.

Our Common Future, the 1987 report of the World Commission on Environment and Development,[2] underlines the connections among poverty, international policy, and environmental degradation. The report emphasizes that "poverty itself pollutes the environment...Those who are poor and hungry will often destroy their immediate environment in order to survive." They will cut forests, overgraze grasslands, overuse marginal land, and crowd into congested cities. "The cumulative effect of these changes is so far-reaching as to make poverty itself a major global scourge."

Nowhere is this connection more graphically illustrated than among the famine-ravaged people of Africa who have grown so familiar on U.S. television screens in recent years. Their plight, to quote again from Our Common Future,

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[2] World Commission on Environment and Development, Our Common Future (New York: Oxford University Press, 1987) is the best single "textbook" on sustainable development.

> ...tragically illustrates the ways in which economics and ecology can interact destructively and trip into disaster. Triggered by drought, its real causes lie deeper. They are found in part in national policies that gave too little attention, too late, to the needs of smallholder agriculture and to the threats posed by rapidly rising populations. Their roots extend also to a global economic system that takes more out of a poor continent than it puts in. Debts that they cannot pay force African nations relying on commodity sales to overuse their fragile soils, thus turning good land to desert. Trade barriers in the wealthy nations--and in many developing ones--make it hard for Africans to sell their goods for reasonable returns, putting yet more pressure on ecological systems. Aid from donor nations has not only been inadequate in scale, but too often has reflected the priorities of the nations giving the aid, rather than the needs of the recipients.

Throughout Latin America, Asia and Africa, the worst poverty is found on the most degraded lands. And the worst rates of desertification, deforestation and soil and water loss are found where human degradation is most severe. Achieving sustainable economic growth by curbing population growth and improving resource management requires an all-fronts attack on areas where poverty and environmental degradation exist together.

Why Should We Care?

Of what importance to the United States are these Third World trends in poverty and resource depletion? Besides the profound moral connection we feel with human suffering everywhere, I believe there are some very hard-nosed, even selfish reasons--economic and security reasons--why Americans should be concerned about Third World environment and development issues. The astonishing degree of worldwide interdependence that has evolved since World War II means that the United States, like all other nations--is more fiscally, economically and militarily vulnerable to developments beyond our borders. The developing countries already provide the United States with a larger export market than all the industrialized nations together, excluding Canada. If those nations can recover from the crushing debt-induced economic depression of the 1980s and grow and prosper, they will be, given their population growth, even more important trading partners in the future.

On the political side, developing countries also deserve attention from U.S. policymakers.[3] In the early 1980s a CIA review of world "hot spots" that could cause trouble for U.S. interests listed explosive overcrowded cities like Cairo and Mexico City, disputed resources, and economic and environmental refugees. In four country case studies done for a recent WRI book, In the U.S. Interest, analysts familiar with both the environmental and political issues in each country looked at the impact of resource degradation on the economic prospects and political stability. These four countries--Mexico, Egypt, Philippines and Kenya, all considered friendly and important allies of the United States--are not the poorest of the poor. Indeed, all but the last are considered by the World Bank to be "middle income" countries. They have enjoyed considerable development success since the 1960s. Yet in every one, the analysts found ominous population and resource trends that, if unchecked, threaten their continued usefulness as stable friendly countries. On other fronts, the spreading scourges of drug addiction and AIDS and their connections to developing countries, demand new levels of U.S. attention to Africa, Latin America and Asia.

But perhaps the most compelling reasons for caring about the developing countries are the global environmental reasons. For if we are thinking about international security not in the cold war terms of the past generation, but in terms of global systems changes--global warming, tropical forest destruction and loss of biological diversity and widespread critical water problems--then we'd better reorient our foreign policy strongly toward the third world. For, though it's the profligate and wasteful use of resources in the United States and other highly industrialized, rich countries that got the planet into the current mess, it's the contributions of the developing countries to the greenhouse effect, pollution and resource depletion that are growing the most rapidly. The developing countries have the worst urban and industrial pollution in the world. Severe water-logging, salinization and soil erosion call into question their ability to provide food for their peoples. Already tropical forest loss accounts for more than 20% of the annual contribution to global warming.

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[3] For an excellent analysis of U.S. "security" interests in global environmental issues, see Jessica Tuchman Mathews, "Redefining Security," Foreign Affairs, vol. 68, No. 2, Spring 1989.

The current debate about U.S. foreign assistance--focussing as it does on Eastern Europe, Panama and Nicaragua vs. Israel and Egypt--fails to address the real development and environment challenges in key third world countries. The world's geopolitical systems may be faring better these days, but its ecological systems are in trouble. U.S. foreign policy should be focussing on the problems in front of us, not those behind.

What is needed is a global bargain between North and South, a series of international compacts for environmental protection and economic progress. A forward-looking U.S. foreign policy would include:

> Long overdue attention to the developing countries, which have the fastest growing populations and the most severe environmental pollution and degradation;
>
> Debt relief and increased trade flows with developing countries in return for policy incentives for better resource management and increased investment in health and family planning;
>
> New levels of U.S. cooperation for environment and development, replacing the outmoded U.S. foreign assistance program, the bulk of whose funds go for military assistance and economic relief, both of them dispensed largely on the basis of short-term political interests.

In the 1990s the world's problems of environment, poverty and population are such that neither the North or South can solve them without the cooperation of the other. The developing countries require sharply increased trade, investment, and development assistance flows and new technology for environmental conservation and sustainable development. And the industrialized countries can not slow global warming without the cooperation of the developed, for all of our possible gains in phasing our CFCs and reducing emissions of all other warming gases will be offset by the growth in developing countries.

This is a new age requiring fundamentally different international politics. The big question is, do we have the political will to move in new directions? I believe we do. If the American people understand the global environmental context in which the new politics takes place, they will lead the politicians, as they always have. Environmental education is central to that process. More than ever, education is required to get our global systems in order.

Symposium 2: Environmental Education in Mexico

This symposium provided an opportunity for Mexican and American environmental educators to exchange experiences, research information and ideas. It served as a milestone for future happenings in environmental education in Mexico as well as in facilitating joint efforts between American and Mexican environmental educators.

Several leading environmental educators from government agencies and universities located in Mexico spoke at the session. Papers were presented in Spanish and simultaneously translated into English. The papers presented will be published in a special proceedings in Spanish and an annotated directory of Mexican environmental educators will also be available.

Symposium 3: Contesting Paradigms In Environmental Education

This symposium provided a forum for considering and appraising alternative approaches to environmental education research. Topics addressed include: the nature of alternative paradigms in environmental education research; the history of these traditions; assumptions about the relationship between theory and practice; assumptions made about the four common places of education---teachers, learners, subject matter, and milieu; interpretations of vigor, validity, and generalizability in environmental education research; and the role of a professional education journal in providing a forum for debate of research questions.

The morning session included a panel of presenters followed by a critical reaction from a second panel to help phrase specific questions for small groups to address in the afternoon. These small groups had an opportunity to report their findings and possible suggestions for research proposals which could involve a greater number of NAAEE members.

Organizers of the symposium include Dr. Ian Robottom, Dr. Paul Hart, Dr. John Disinger, and Dr. Rick Mrazek with cooperation for the North American Commission on Environmental Education Research.

Symposium 4: Corporate Partnerships In Environmental Education

Examples of Environmental and Conservation Education Programs implemented by corporations at the state or national level were described. The symposium included corporations such as the oil and gas industry, utility companies, forest products industries, chemical companies, and transportation companies.

The symposium included a panel of representative corporations explaining their interests and reasons for supporting environmental education; what they are doing to promote environmental education; and any resources or classroom materials available for distribution to educators. A question and answer session concluded the program.

Symposium 5: National Issues Forum

The National Issues Forum (NIF) is an enormously flexible program that has been used by different organizations around the country to promote understanding on a variety of controversial issues. During the first part of this seminar, Megan Scribner from the Network For Public Debate, and Michele Archie from Kettering Foundation provided an overview on the content and process of NIF. Then, NAAEE members John Judy and Martha Monroe described the Forums they have conducted on environmental issues.

The second part of the seminar included more detailed information on the NIF process and its approach to public participation and problem solving. Participants had the opportunity to learn more about techniques for moderating a Forum and share ideas about sponsoring NIF in your community.

Symposium 6: A Solid Waste Symposium--Adventures in Garbage

This symposium was divided into two sessions. One addressed solid waste topics and began with a broad overview of the dilemma. Discussions on plastics, biodegradability, and "the diaper debate" were featured. Speakers were from EPA's Waste Management Division, Dupont Corporation, and Proctor and Gamble.

The second session focused on classroom activities and materials dealing with solid waste. Participants examined a selection of programs and guides including: Don't Mess With Texas, N.J. Trash Museum, and Borrowed Time.

STRAND I: From Research to Application in Environmental Education

ENVIRONMENTAL CONTENTS IN THE PRIMARY SCHOOL CURRICULUM OF MEXICO

Alicia de Alba
La Guadalupe Contreras, Mexico D. F.

The paper is a short report of research about the environmental contents in the Primary School Curriculum of Mexico. Important topics available for the teachers to use in the classroom are described. At the same time we will discuss the necessity of a structural curriculum change in environmental education. Ideas of this structural change will be presented.

NOTE: The presentation will be in Spanish

TRAINING LEADERS ABOUT GROUNDWATER PROTECTION: SUMMARY OF FOLLOW UP SURVEY

Elaine Andrews
University of Wisconsin Extension
Madison, Wisconsin

Abstract

Leaders from 5 Wisconsin counties completed a one day training program in spring 1989. This presentation will summarize the dynamics of designing the workshop and the results of a winter, 1990, participant survey of training program effectiveness. The survey evaluates understanding of concepts, quality of and access to educational support materials available to leaders, and frequency and types of uses of training information and materials.

This report describes local impacts of a Wisconsin Cooperative Extension leader training program. Results summarize a participant survey conducted ten months after the completion of county workshops.

The purpose of the project was to develop a leader training model for the groundwater resource, to provide an example of multi-county/multi-disciplinary Extension "issues" programming and to provide sponsoring counties with instructional materials necessary for future workshops. A premise of the project was that improved understanding of groundwater by Wisconsin residents would increase voluntary action to protect this resource. Funding for materials and equipment was provided by a grant from the University of Wisconsin Cooperative Extension Service.

The model workshop was designed to serve leaders in five (5) Wisconsin counties. One hundred seven adults (107) were trained in three (3) workshops offered during the winter of 1989. On average, participants were quite knowledgeable about groundwater to begin with, but improved pretest scores approximately 10% on a post test. In a self-report workshop evaluation, participants indicated that they were very satisfied with the workshops, that they had learned needed skills and had gained confidence in their ability to teach others about groundwater.

A number of new materials were developed for use in the workshops which will have applications in other educational settings as well. Demonstration and audio-visual materials were purchased for use by leaders in presenting their education programs.

Groundwater Workshops

Key objectives for leader training sessions were to provide leaders with training for seven key topics, listed later in Table 3, and to demonstrate support materials available to teach others about each topic. Each County workshop agenda included all topics, but varied the program time allotted to the each. A special feature of the agenda were breakout sessions designed to provide an in-depth learning experience for three leader groups in areas most relevant to their potential audiences. The planning committee brainstormed leader audiences for consideration in each county and approved a generic publicity flyer to be used by the county teams, but each team chose their own methods and audience for workshop publicity.

Workshop Results

Participant background varied, partly due to training needs identified by county faculty and partly due to traditional networks of sponsoring faculty.

TABLE 1 - County Participation by Leader Group

COUNTIES SERVED	4-H LEADERS	OTHER YOUTH LEADERS	UWEX HOMEMAKERS	ADULT GROUP LEADERS	PUBLIC OFFICIALS	PUBLIC STAFF
Waupaca/Waushara Total 35	0	5	8	4	13	5
Adams/Marquette Total 36	8	4	16	2	4	2
Waukesha Total 37	2	10	0	18	6	0
TOTALS Counties: 107	10	19	24	24	23	7

Success was measured through participant reactions and participant borrowing of demonstration equipment. Other potential benefits of Extension "issues programming" is the combination of a wide range of community clients in one workshop and faculty perception of experiencing personal/professional growth from working towards common goals in a team experience.

Each participant made a commitment to help others to better understand groundwater over the following 6 months. Participants planned to talk to neighbors, students, Homemaker Clubs, church groups, teachers, 4-H clubs, and others about what they had learned.

Post Workshop Participant Survey

In the fall of 1989, Extension specialists and faculty from the five counties developed a follow up survey tool. A survey specialist, Dr. Peter Nowak, was consulted in survey design and methodology.

The survey consisted of three (3) sections:

I. Your Participation-to verify leader groups and leadership roles.

II. Use of Workshop Materials-to learn where and how often materials were used and to determine the value of specific topics to participants.

III. Adequacy of Assistance and Materials-to learn about success of materials in a variety of situations and to provide an opportunity for expressing opinions of future needs.

The survey was distributed to all 107 workshop participants accompanied by a cover letter from appropriate county faculty. Prior to survey delivery, the survey was announced with a personal letter. Later, participants were contacted by phone and received a reminder memo. One county received a second set of surveys due to low response rate.

Highlights of Results

I. Your Participation

Seventy two percent (72%) of workshop participants responded to the survey by early February. Responses from each leader group was roughly proportional to the workshop groups. The adult group, however, was more clearly separated into those that participated as part of an organization and those that attended for their own interests.

TABLE 2 - Participant Response by Leader Group

PARTICIPATION	ADULT	LOCAL GOV	YOUTH	AGENCY	CITIZEN	OTHER
% Workshop Participants	44.9	21.5	27.1	6.5	n/a	n/a
% Of Respondents	28.6	23.4	23.4	3.9	14.3	6.

Forty percent (40.3%) indicated an understanding of the purpose of leadership training by choosing "To obtain information and assistance about groundwater issues that I could take back to my group" out of three choices.

Sixty one percent (61%) indicated that they had been involved in one or more of nine group leadership activities. Approximately two thirds of workshop respondents had been correctly identified as leaders of specific groups, but less than half understood that they were expected to share what they had learned with their group.

II. Use of Workshop Materials

Favored situations for use of new information were: personal situations, informal discussions, and presentations. Depending on leader group, sixty to one hundred percent (60 - 100%) of respondents used materials at least once in these situations. Other uses of note were the seventy eight percent (77.8%) of youth leaders who used the materials to design learning activities and the proportionally high use of the media by agency leaders.

Forty two percent (42%) of respondents used workshop materials "more than twice". Out of seven barriers to use, no one designated the "lack of information". High use of materials is also reflected in responses to a question about use of video tapes, groundwater models and water testing kits.

Importance of specific workshop topics were ranked as shown in Table 3:

TABLE 3 - Ranking of Importance of Workshop Topics

%CHOICE AS RANK	TOPIC IN RANK ORDER
1. 35.1	How contaminated drinking water affects health
2. 32.5	How groundwater moves, where it comes from
3. 20.8[1]	Sources of water contaminants in the local setting
4. 15.6[2]	Use of water testing to determine the presence of contaminants
5. 15.6[3]	Management of local water contamination sources
6. 27.3	Materials, resources for teaching youth about groundwater
7. 41.6	Relationship between water quality and laundry cleaning

[1] average of second, third and fourth choices; weight was third

[2] average of second, third and fourth choices; weight was second and fourth

[3] average of second, third and fourth choices; weight was fourth

The ranking indicates that the primary components of the workshop were useful to workshop participants, but that information presented only in breakout sessions (topics 5,6,7) was less important than information presented to the group at large.

III. Adequacy of Assistance and Materials

Respondents did not respond to questions about adequacy of information unless they felt the materials were exceptional or adequate. However, Table 4 results show a correlation between perception of adequacy of information and use of information in situations summarized earlier. Generally, information was less adequate for presentations and media use.

TABLE 4 - Ranking of Adequacy of Workshop Information and Materials for Specific Situations

USE OF MATERIALS	%EXCEPTIONAL OR ADEQUATE	NO RESPONSE
Personal uses	62.4	35.1
Informal discussion with others or with group	62.4	36.4
Formal presentations to groups	49.4	48.1
For newspaper, radio, or TV	15.6	75.3

Leader training guides and support materials were provided with the groundwater model, the water testing kit and for special group needs, but sample public service announcements were not provided. These results may suggest that formal presentations are not as important to the work of these leaders, that additional training is needed, or that materials need to be improved.

Finally, participants were asked to provide a personal opinion of their county's progress toward groundwater protection. Fifty eight percent (58.1%) felt that some progress towards groundwater protection was being made in their county. However, thirty four percent (33.8%) thought that minimal or no progress was being made, a response heavily weighted by respondents from two counties.

In Summary

The workshops were successful at increasing use of accurate information about groundwater in informal situations by leaders. However, more emphasis should be placed on expectations of participants as leaders of the group they represented.

Although use of information and materials was high, additional leader training activities may increase use of equipment available through the county Extension office due to increased familiarity with Extension services. Follow up workshops could also provide leaders with an opportunity to practice making formal presentations about groundwater and would enhance further use of materials for those purposes.

As leaders become more familiar with general information about water quality and groundwater dynamics, workshops about groundwater management strategies will become more significant to them.

THE EFFECTS OF PRESCRIBED BURNING ON THE HOME RANGE OF THE WHITE-TAILED DEER

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Texas Military Institute
San Antonio, Texas

A radio telemetry study of the effects of prescribed burning on the home range of 6 white-tailed deer (Odocileus virginianus) was conducted at the Kerr Wildlife Management Area of west-central Texas. The data collected was used to determine the minimum home range for each deer before, during, and after a 26 January 1984 prescribed burn. This study presented evidence that prescribed burning is an effective environmental and wildlife management technique.

THE EFFECT OF WORKSHOP PARTICIPATION ON TEACHERS' CLASSROOM ACTIVITIES

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Abstract

Data were gathered verifying curriculum changes by teacher/participants in seven weekend workshops. Workshops had several presenters who provided objectives measurable in terms of time spent. Significant increases of objective-related activities and topics were reported for the first two years following the workshop with a third year decline.

Weekend inservice workshops for teachers of environmental education have been with us for so long that they may be considered part of a hallowed tradition. We have planned, presented, evaluated and defended them for decades and the question has persisted, "Do they really change teacher behavior?" Our answer has always been, "Yes" and then we have proceeded to sight examples of teachers who have picked up ideas at weekend workshops and have used them with success in their classes. I have never had data to back up my certainty. This paper presents the results of a three year study designed to gather the data needed to answer the question of efficacy.

This study was designed to provide an answer of practical use to supervisors and therefore is based on weekend inservice workshops which have a fairly broad range of structure. All seven of the workshops included in the study began on Friday evening and ran through Saturday afternoon. Some had an additional Sunday morning session. All were presented in various sites in Iowa, although some had sleeping accommodations and others required participants to return home for the night. All workshops had an environmental theme but, most had sessions only broadly related to the theme. All the workshops except "Spring: Emergence" had multiple sessions from which participants could choose. All workshops had multiple presenters. Most sessions included hands-on activity with often one session at a workshop devoted to background content related to the major workshop theme. Attendance at the workshop was at the teacher's option. Some participants opted for university graduate workshop credit and others were non-credit participants. Some participants were high school teachers but most taught elementary or junior high school. Workshops were conducted between May 1985 and January 1987.

To determine the effect of the workshop on participants' curriculum, data were gathered on the teachers' perception of time they spent with students on specific topics or activities. Teachers were asked how much time they spent on specific workshop session topics before the workshop and after. Data were gathered for three successive years after the workshop participation. To determine appropriate topics or activities on which to gather data, presenters were asked to write objectives for their presentation. The objectives were written in terms of student activities or topics for which the presenters wanted to prepare the teachers. Some presenters needed assistance in preparing such objectives. Many of the objectives given needed to be rewritten before they could be used as items in the data gathering instrument. It was possible to use three objectives from most sessions for data gathering. Some objectives were for very specific student activities and some were of a more general nature. This variation was most often appropriate for the presentation topic.

As is typical of a workshop with multiple sessions, the number of teachers attending a given session varied. Accordingly, the number of participants responding to the questionnaire for any given session varied from 0 to 22. The number of respondents decreased each year. This is to be expected because of teachers leaving the teaching field and changing positions. The average number of hours spent by participants on workshop activities and topics for the year previous to the workshops was 1.15. During the first year after the workshops this jumped to 2.05 hours, the second year declined slightly to 2.01 hours and the time dropped to 1.78 hours the third year. This data are incomplete for the third year. Tabulation of data for four workshops for the third year is now being completed.

A summary of the data in Table 1 shows an increase in time spent during the first year after the workshop. For all but two workshops, there was an increase in the second year over the time spent the first year. This increase was not as large as the first year, but any increase was surprising. It had been expected that new of ideas would fade and new competing ideas would begin to take the place of the activities learned two years before. Data tabulated for three workshops for the third year show a decrease in time spent. A significant difference (.01 level) was found for each workshop for each of the three years with two exceptions. A comparison of pre-workshop and year three of the Season of the Snow Moon gave a P of .30, and a comparison of pre-workshop and year two of Atmospheric Rhythms of Air gave a P of .27.

Table 1. Mean Difference in Hours Spent

	Yr. 0-1	Yr. 0-2	Yr. 0-3
Spring: Emergence	0.82	1.16	0.84
Themes of Nature	1.09	1.51	0.87
Season of the Snow Moon	0.67	0.68	0.22
Nature's Kaleidoscope	0.48	0.70	
Year of the Tree	0.78	0.83	
Living and Teaching Land Ethic	1.59	1.86	
Atmospheric Rhythms of Air	0.64	0.22	

This study shows that weekend workshops of the type described do make a difference in what teachers do in their classrooms in terms of time spent on conducting activities with students. The effect is strongly evident the first year after the workshop and can be expected to be slightly more evident the second year. There is also strong indication that the effectiveness is still significant the third year after a workshop, although declining notably.

Teacher training workshops are an instruments which can very effectively change classroom curriculum and for this reason presentations should be carefully chosen. The effect is significant for at least three years but if the maximum effect is to be maintained, reinforcement or some type of support system needs to be introduced by the third year.

DOES PARTICIPATION IN AN ACTION/PROBLEM SOLVING CURRICULUM LEAD TO EMPOWERMENT AND THE BUILDING OF PROBLEM SOLVING SKILLS?

James N. Bull
University of Michigan
Ann Arbor, Michigan

This paper reports on research on the Action Research Community Problem Solving Model in inner city Detroit Public Schools. Students were involved in a community walk to identify environmental problems, then worked in small groups to select a problem, and work through a process of trying to make an impact on its resolution. Pre and post tests were given to both experimental and control groups.

COMMUNITY STUDIES SERVE AS VEHICLES FOR MOVING TEACHERS AND STUDENTS TO ACTION

Diane C. Cantrell
The Ohio State University at Newark
Newark, Ohio

How willing and able are teachers and students to become involved in community studies and action plans? This naturalistic research study evaluated to what extent and in what manner teachers implemented into their school curriculum programs and practices presented during a summer institute which used community studies to investigate local environmental issues.

SCHOOLYARDS AS CLASSROOMS: A STUDY OF THEIR EFFECTIVENESS

Dr. Linda Cronin-Jones
University of Florida
Gainesville, Florida

Over 200 elementary students participated in a study comparing the influence of traditional indoor and outdoor schoolyard instruction on knowledge and attitudes toward wildlife. Students participating in outdoor, field-based activities scored significantly higher on both knowledge and attitude measures than their indoor, textbook-based counterparts.

FROM IDEAS TO ACTION

Karen Armstrong Cummings
ACT Research

David Wicks
KAEE
Louisville, Kentucky

During 1989, The Kentucky Association for Environmental Education conducted a study of State Government's role in environmental education called This UnCommon Opportunity; an Environmentally Literate Kentucky. This session will discuss the research procedures, the findings and the resulting legislation introduced during 1990.

THE CONCEPT OF PROJECT AS APPLIED IN AN INTERDISCIPLINARY ACTION MODEL FOR ELEMENTARY AND SECONDARY SCHOOLS

Dr. Charles de Flandae
Universite du Quebec a Montreal
Montreal, Quebec, Canada

This presentation illustrates the concept of project relative to environmental education, describes an interdisciplinary model based on problem solving and communicates a descriptive analysis of the results of a research action project in elementary school classrooms. Slides will serve to illustrate the application of the model.

CONTROL DE DESECHOS SOLIDOS EN UN CAMPUS UNIVERSITARIO

Ma. Elena Barajas de Kossio
Universidad de Sonora
México

Abstract

Universities throughout Mexico share the same littering problems. Paradoxically, college students who have the best opportunities that our economic systems provide, show a lack of pro-environmental behavior. A research study at the University of Sonora showed that littering control among students and staff required specific strategies for environmental education. The results of this study are worth sharing with other Universities.

EL HOMBRE HABITA DOS MUNDOS: Uno, el mundo de la naturaleza, con tierra, aire y agua para dar albergue a plantas y animales, estos elementos nos preceden por millones de años y aún asi, formamos parte de ellos. El otro es el mundo de las instituciones sociales y de los artefactos que hemos construido utilizando herramientas y motores; la ciencia con su promesa de subordinar al medio-ambiente a los deseos del hombre.

Los pobladores del siglo que termina, somos testigos del problema mas grave que haya enfrentado la humanidad: el desarrollo tecnológico alcanzado y la sobrepoblación de nuestra especie han precipitado el rompimiento del balance entre nuestros dos mundos, biósfera y tecnósfera han rebasado su capacidad de coexistencia. Este es el panorama de la historia en la cual participamos; tenemos por delante

un futuro que ha de enfrentar la crisis mas grave, y global de que se tenga memoria, por tal las soluciones deben ser acordes a la magnitud de la problemática medio-ambiental que vivimos.

Los problemas medio-ambientales surgen ligados a nuestros estilos de vida y de producción; esto, aunado al consecuente uso que damos a los recursos de la naturaleza. El carácter global de la problemática ha propiciado la investigación inter y multidisciplinaria; y para fines de estudio se han forzado jerarquías y clasificaciones basadas en el impacto que el ambiente tiene sobre el hombre, su conducta, y su salud.

Los problemas del balance ambiental o ecológicos han sido atacados por casi todas las disciplinas científicas, sin embargo el común denominador de los estudios ha sido abordar situaciones emergentes. La Psicología Conductual es una disciplina fértil en el diagnóstico y solución de problemas medio-ambientales (Proshansky, Ittelson y Rivlin, 1978; Cone y Hayes, 1980; Glenwick y Jason, 1980; Geller, Winett y Everett, 1982), sin embargo en nuestro país se han realizado muy pocas investigaciones ecológicas que involucren a la conducta humana como un factor determinante de la protección ambiental.

Los estudios preventivos son escasos y recientes, estos utilizan como principal estrategia el "alertar" y educar a la población sobre prácticas de protección ambiental. Sin embargo la educación ambiental es un fenómeno muy peculiar ya que por ejemplo, se esperaría que la población con mayor acceso a la educación, la que ha tenido oportunidades profesionales actuara acorde a su nivel: cuidando su entorno, y siendo un modelo pro-ambientalista para la población con menos oportunidades; sin embargo, no es asi (Nava, 1987). La ausencia de una educación ambiental efectiva a nivel profesional se hace patente en el deterioro ambiental que guardan las instalaciones universitarias de nuestro país, y a mediano plazo los universitarios que se integran a la vida productiva del país se desempeñan profesionalmente contribuyendo con el deterioro medio ambiental; de hecho, muchos de los problemas que ahora sufrimos han sido provocados y mantenidos por profesionistas que en situaciones de toma de decisiones no incluyen la dimensión ambiental en sus esquemas de trabajo; profesionistas que "pretendiendo" ser productivos deterioran el ambiente y las condiciones de vida de las futuras generaciones.

Los planes de estudio a nivel profesional de nuestro país no contienen asignaturas destinadas a evidenciar al futuro profesionista el impacto ambiental de su actividad profesional o bien las herramientas que desde su perspectiva profesional podrian utilizarse para propiciar el cuidado del medio ambiente.

La Universidad de Sonora

Nuestra Universidad comparte con el resto de la entidad sonorense, los mismos problemas ambientales, sin embargo, el compromiso para resolverlos es mayor. La Universidad debe ser la instancia generadora de modelos y tecnología pro-ambientalista para asi estar en posibilidad de ofrecer solución a los problemas ambientales de nuestra comunidad. Se requiere por tal, desarrollar proyectos de investigación, tendientes a generar estrategias que solucionen en primera instancia los problemas medio-ambientales dentro del campus universitario, para después constituirnos en fuente confiable de los mismos problemas en los ecosistemas de nuestra entidad.

En la Escuela de Psicología y Ciencias de la Comunicación se inició en el mes de Abril del presente año el "Proyecto Campus: Educación y Protección Ambiental". Nuestro proyecto es ambicioso ya que planea dar solución a los problemas ambientales mas graves: a) contaminación por residuos sólidos (basura), polvos y humos, b) uso irracional de los recursos: agua, energía eléctrica, deterioro y vandalismo de muebles e inmuebles, c) planeación arquitectónica y de áreas verdes que no han sido planeadas en armonía con el desierto que es nuestro habitat.

Nuestro proyecto se ha iniciado tomando como primer problema de investigación el CONTROL DE DESECHOS SOLIDOS o basura, problema que por su magnitud en nuestro campus, requirió de un estudio con metodología especializada, de apoyo institucional, pero sobre todo, de la participación y educación de toda la comunidad universitaria.

El diseño general de investigación que se implementó, consideró las fases siguientes:

Fase I Diagnostica

a) Selección de Técnicas de Observación y Registro.
b) Selección de Escenarios y Conductas ambientalmente relevantes.
c) Medición Disgnóstica.

Fase II Estrategias de solucion

Selección de Estrategias a todos los niveles.

- **a) Institucionales y Organizativas.**
- **b) Cambios a los Escenarios y a la conducta de sus usuarios.**
- **c) Educación formal e informal, Programas de participación comunitaria y Organización de grupos.**

FASE III Evaluacion

FASE IV Generalizacion de estrategias a otros escenarios.

Procedimiento

Utilizando la metodología ya probada de la Psicología Ambiental de enfoque conductual se levantaron registros de la forma en que se dispone de los residuos sólidos en las aulas y sus exteriores.

Exteriores:

Se eligió el área exterior del campus comprendida entre los Edificios C, E, F, G, y H, por ser el área mas crítica en cuanto a desechos sólidos; lo anterior se debe a que esta es un área sobrepoblada con estudiantes de psicología, ciencias de la comunicación, administración de empresas y ciencias sociales. Se registraron los siguientes eventos:

- a) Con qué frecuencia se tira basura. # de tiradores/tiempo.
- b) Quiénes tiran basura. Femenino o masculino.
- c) Qué actividad realizan cuando tiran basura. Grupal.

Aulas:

También se monitorearon las aulas del Edificio G donde se imparten clases a alumnos de psicología y ciencias de la comunicación. Se consideraron los siguientes indicadores:

- a) Peso total de la basura recolectada al final de una jornada.
- b) Tipo de basura. Se clasificó su procedencia.
- c) Contaminación visual. Superficie del piso con desechos.

La Fase diagnóstica proporcionó datos que cumplen las funciones de Linea Base para asi, poder comparar los resultados de las estrategias a implementar (Ver Cuadro de Metodología).

Resultados

La Fase Diagnóstica sirvió de línea base para comparar los diferentes momentos de la intervención, y para orientar las estrategias.

En Aulas se obtuvieron los siguientes resultados:

a) el peso promedio en la Fase Diagnóstica (F.D.) fué de 145 gms. diarios, los desechos corresponden en un 90% a actividades no académicas.

b) La contaminación visual fue del 19% de la superficie del piso.

c) Servicio deficiente de limpieza.

d) Recipientes de basura deficientes o ausentes.

En Exteriores, la F.D. reportó:

a) Un tirador de basura por cada minuto;

b) tiran por igual hombres que mujeres;

c) el 86% de los tiradores se encontraban comprometidos en actividad grupal;

d) los botes de basura son insuficientes y se encuentran alejados de las actividades generadoras de basura.

e) el servicio de limpieza en exteriores tambien es deficiente.

En la Fase de Intervención (F.I.) se llevaron a cabo:

1. Cambios en el escenario: Botes de basura en exteriores y en aulas.
2. Control institucional para la vigilancia de la limpieza.
3. Programa de Difusión y participación social.
4. Programa de Educación auxiliado de estrategias conductuales.

La Fase de Evaluación (F.E.) reportó cambios significativos:

	F.D.	F.I.	F.E.
Basura/Aulas	145 gms.	50 gms.	21 gms
Contaminacion Visual	19%	10%	3%
Tiradores/Exteriores	1/60 seg.	1/30 seg.	0
Tirador Social	86%	34%	0

Conclusiones

I. Se requiere de mediciones diagnósticas para determinar las direcciones de los programas de mejoramiento ambiental.

II. Son necesarios los cambios al escenario antes de iniciar programas de participación grupal y de educación ambiental.

III. Solamente estrategias múltiples como la aqui planteada podrán ayudar a resolver el problema de la aprobación social ante conductas como la de tirar basura.

Las estrategias por nosotros empleadas para disminuir la contaminación en el campus de la Universidad de Sonora podrian ser generalizadas a otras universidades de Latinoamerica que padecen contaminación por desechos sólidos.

Sin embargo, lo mas relevante de nuestro trabajo fue el descubrir que no basta con niveles altos de educación formal para actuar pro-ambientalistamente. De aqui se desprende la conclusión de trabajar a mediano plazo con programas que incluyan en la currícula universitaria material relativo al impacto ambiental del quehacer profesional de todas y cada una de las opciones profesionales. Asi, el día de mañana nuestros profesionistas contemplarán la dimensión medio-ambiental en su vida productiva.

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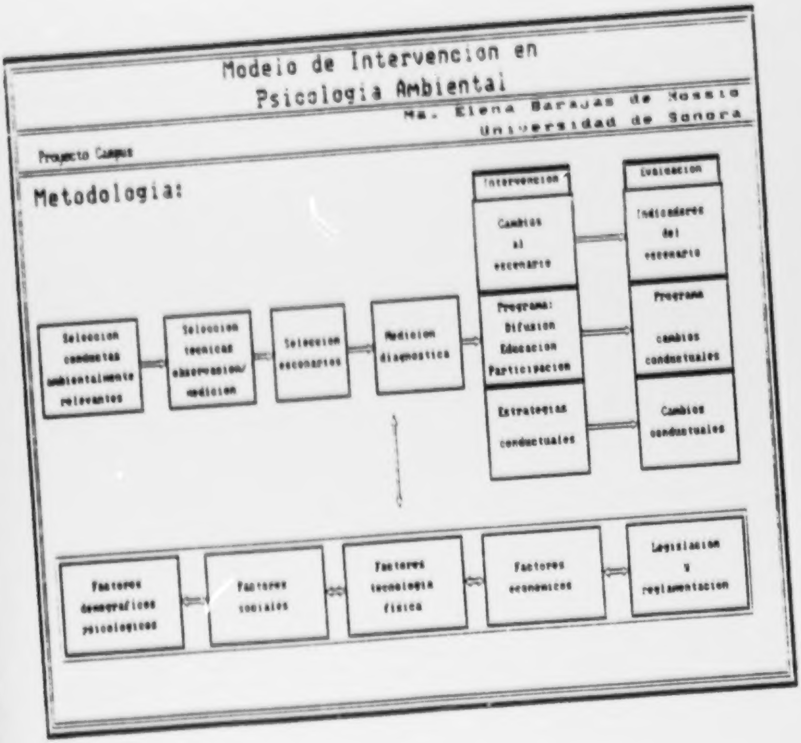

Modelo de Intervencion en Psicologia Ambiental

Ma. Elena Barajas de Mossio
Universidad de Sonora

Proyecto Campus

Metodologia:

Seleccion conductas ambientalmente relevantes

Seleccion tecnicas observacion/ medicion

Seleccion escenarios

Medicion diagnostica

Intervencion

Cambios al escenario

Programa: Difusion Educacion Participacion

Estrategias conductuales

Evaluacion

Indicadores del escenario

Programa cambios conductuales

Cambios conductuales

Factores demograficos psicologicos

Factores sociales

Factores tecnologia fisica

Factores economicos

Legislacion y reglamentacion

ESTRATEGIAS EFECTIVAS PARA LA EDUCACION AMBIENTAL

María Elena Barajas de Kossio
Elisa Eugenia Corrales Vargas
María Eugenia Santacruz Cuevas

"Nuevos Horizontes"
MEXICO

Abstract

In this study two elementary school groups were compared. In the control group children received pro-environmental education based on conceptual and traditional strategies in education. In the experimental group children were trained to perform environmental protective behaviors. Here conceptual issues were linked to behavioral strategies such as vigilance and conter-vigilance. Our experimental procedure proved to be the best way to promote environmental care.

El presente trabajo representa un esfuerzo por comparar los resultados de programas convencionales en materia pro- ambientalista y programas basados en estrategias conductuales. Se eligió como tópico experimental el Tratamiento Adecuado de Desechos Sólidos (basura).

HIPOTESIS

"El traducir los conocimientos en materia ambiental en acciones pro-ambientalistas concretas, probabiliza su adquisición, mantenimiento y generalización".

VARIABLES

VARIABLE INDEPENDIENTE (V.I.). Procedimiento para hacer explícito el impacto ambiental provocado por la propia conducta, asociado a aprobación social.

VARIABLE DEPENDIENTE (V.D.). Porcentaje de Respuestas Correctas consideradas en el inventario de Conductas Protectoras del Tratamiento Adecuado de los Residuos Sólidos.

Metodo

SUJETOS

Participaron en este estudio 40 niños que cursaban del primero al cuarto grado de educación primaria de edades entre los siete y los diez años. Diez niños de cada grado de los cuales 5 fueron asignados al Grupo Experimental (G-E) y 5 al Grupo Control (G-C).

Grupos

En el experimento se utilizaron dos grupos: uno Experimental (G- E) y otro Control (G-C). La asignación de los niños a uno de los dos grupos se realizó bajo el criterio de la llamada variable de pareamiento que consiste en una medición inicial cuyos puntajes permitirán estructurar grupos equivalentes. Seguidamente mediante un procedimiento aleatorio (de rifa), se determinó que niños participarían en el G-E y que niños en el G-C.

Escenario

El estudio se llevó a cabo en el Centro de Educación Preescolar y Primaria "Nuevos Horizontes, Sección Bijou". Durante las fases I, III y IV se trabajó al aire libre, en el campo de recreo del mismo; y solo en la fase II en las aulas de cada grado. También durante la segunda parte de la fase III el escenario de trabajo para los niños fueron sus propios hogares.

MATERIALES

Se utilizó un inventario de conductas protectoras del tratamiento adecuado de la basura (validado por Barajas y Corrales, 1987) que contiene en sus reactivos la descripción de acciones concretas sobre las mismas.

Además de este inventario que consta de 8 items y que fue requerido durante las cuatro fases, se utilizaron hojas de registro para las observaciones que los niños realizaron en sus hogares durante la fase III.

Sistema de registro

El registro de las conductas consignadas en el inventario se llevó a cabo de dos formas: 1) INDIVIDUAL y 2) GRUPAL.

DISEÑO EXPERIMENTAL

Diseño multivariable por contrastación de fases del tipo

A B C D

FASES	G-E	G-C
Fase A	Línea Base "A"	Línea Base "B"
Fase B	Programa Informativo	Programa Informativo
Fase C	Estrategia Conductual: VIGILANCIA entrenamiento a los a los niños en conductas protectoras S , énfasis verbal en las consecuencias naturales 12 sesiones de 15' CONTRAVIGILANCIA los niños registran a sus padres por 5 días los padres dan retroalimentación a sus hijos	
Fase D	Línea Base "B"	Línea Base "B"

La utilización de este tipo de diseño permitió la contrastación por fases de ambos grupos. Es decir, ir midiendo los cambios ocurridos en cada una de ellas y realizando comparaciones entre el G-E (con VI) y el G-C (sin VI).

FASE I o de Línea Base "A". Como medición inicial se aplicó el inventario en forma individual a todos los niños que conformaban la población total de la escuela , de los cuales y mediante el prodecimiento ya señalado de la variable de pareamiento se eligió la muestra participante de 40 niños, mismos que no recibieron consecuencias conductuales de ningún tipo.

FASE II o Informativa (Sesiones 21-67). En esta fase todos los niños del estudio obtuvieron información en materia ambiental a través del programa conceptual que incluía temas como: "Ecosistemas", "Equilibrio Ecológico", "Importancia del Agua", "Clasificación de los residuos", "Tratamiento de los residuos Humanos", "La funcion de la energía en el equilibrio ecológico", entre otros. El instructor podía auxiliarse de un sistema de contingencias en el momento de llevar a cabo la transmisión de información a los niños.

Esta fase se evaluó en dos situaciones:

1) actividad dirigida (recortado y pegado de figuras de cartón)

2) juego libre (recreo)

FASE III o de Entrenamiento (Sesiones 68-91). Durante la implementación de esta fase solo participaron los niños del G-E y se introdujo la estrategia conductual (VI) de vigilancia y contravigilancia.

VIGILANCIA. Consiste en la detección (observación) de los cambios ambientales generados por la propia conducta, los cuales al detectarse, permiten la regulación de la conducta futura, dependiendo de su explícito impacto ambiental.

En el transcurso de 12 sesiones los niños fueron entrenados como vigilantes de acuerdo a las conductas especificadas en el inventario. El instructor hizo uso de consecuencias conductuales a corto plazo, rescatando la interacción social como mediadora y facilitadora de la adquisición y mantenimiento de dichas conductas. Asi en las primeras sesiones de entrenamiento, se utilizaron reforzadores extrínsecos (sociales) que hacia la cuarta sesión se asociaron con la descripción de las consecuencias naturales de su conducta manteniéndose hasta el final del entrenamiento.

Posterior a esto, se llevó a cabo la evaluación correspondiente en dos situaciones:

1) actividad dirigida (recortado y pegado de figuras de cartón)

2) actividad libre (recreo)

CONTRAVIGILANCIA. Consiste en que los niños observen el comportamiento de sus padres (vigilen), les den información sobre el impacto ambiental de sus acciones, y que los padres a su vez retroalimenten (aprueben) a sus hijos por haberlos alertado de dicho impacto ambiental.

Durante 5 días consecutivos los niños estuvieron observando y registrando a sus padres, a los cuales se les informó previamente sobre lo que harían los niños en sus hogares y la forma en que ellos debían responder. Se les pidió además un reporte escrito sobre los cambios que ellos observaron que se debieron a la estrategia implementada.

FASE IV o Línea Base "B". Las condiciones experimentales en el transcurso de esta fase fueron iguales que en la Línea Base "A". se aplicaron los inventarios a todos los niños del estudio, sin otorgar ningún tipo de consecuencia.

Resultados

Se consideran para estos resultados la Sumatoria de todos los sujetos en Actividad Libre (A.L.) y en Actividad Dirigida (A.D.) Comparación de G.E. vs. G.C.

Tanto en el G.E. como en el G.C. incrementaron los porcentajes de Respuestas Correctas al concluir el entrenamiento convencional, basado en un programa conceptual que sugiere acciones concretas de protección al ambiente (Fase II). Incrementos: El G.E., de 23% en Linea Base (Fase I), aumentó a 24.5% en A.L. y 29.5% en A.D. Para el G.C. el incremento fué de 7% en A.L. y 15.5% en A.D.

Lo anterior nos señala dos cosas importantes, la primera es que el programa informativo favoreció el incremento de acciones concretas de protección al ambiente, aunque al compararlos con los resultados del entrenamiento conductual podrían parecer poco significativos; la segunda es que el incremento fué mayor en la A.D., es decir, en un contexto en el que todos los sujetos y eventos son interdependientes.

Con la introducción de la estrategia conductual de vigilancia y contravigilancia (Fase III), los datos tuvieron un incremento acelerado: en el caso del G.E. el porcentaje de respuestas correctas aumenta en un 65.5%, en A.L. y un 60% en A.D., en comparación con los resultados de la Fase II. El G.C. no participó en el entrenamiento que se realizó, sin embargo, si participó en la evaluación correspondiente a la Fase III, observándose que el incremento alcanzado en la Fase II, se mantenía sin fluctuaciones significativas en sus porcentajes de respuesta, sosteniéndose así a lo largo de la Fase IV.

Incluir a los padres dentro de la estrategia nos ayudó a que las conductas de protección al ambiente se generalizaran a sus hogares y a otros escenarios.

Conclusiones

Educar a nuestros niños en la preservación del ambiente, parece ser la alternativa a seguir; si a través de la escuela trasmitimos conocimientos y valores que van conformando las pautas de conducta en los niños, se deben incluir en los programas educativos el desarrollo de conductas de protección al ambiente.

1. Para facilitar pautas de conducta con una visión pro-ambientalista, la instrucción en materia ambiental debe empezar en etapas tempranas del desarrollo, ya que la labor de re-educación resulta ser más costosa y difícil.

2. Los niños son excelentes multiplicadores. Son ellos los que pueden cambiar el comportamiento de los adultos. Por tal, se sugieren mecanismos que a través de los medios masivos de comunicación, que sean los niños los que promuevan la educación para los adultos.

3. Cualquier propaganda en materia ambiental y a cualquier nivel, se debe ir más allá de la información, deben exhibirse acciones específicas encaminadas a proteger el ambiente. Debe ser prioridad cambiar no tan sólo nuestros conceptos pro-ambientalistas, sino también nuestra interacción efectiva.

EDUCACION AMBIENTAL

SUMA DE TODOS LOS NIVELES

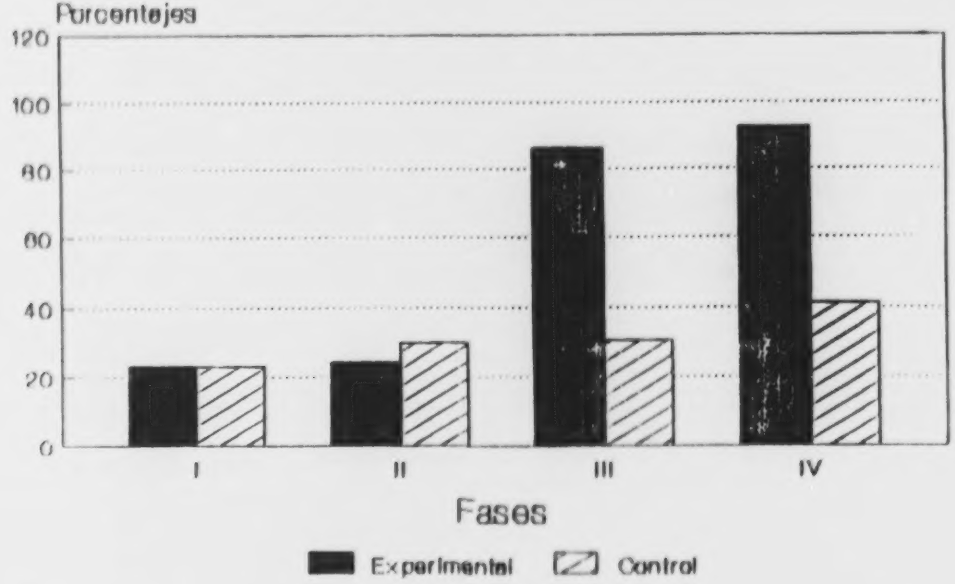

Fig. E 1

Actividad Libre

EDUCACION AMBIENTAL

SUMA DE TODOS LOS NIVELES

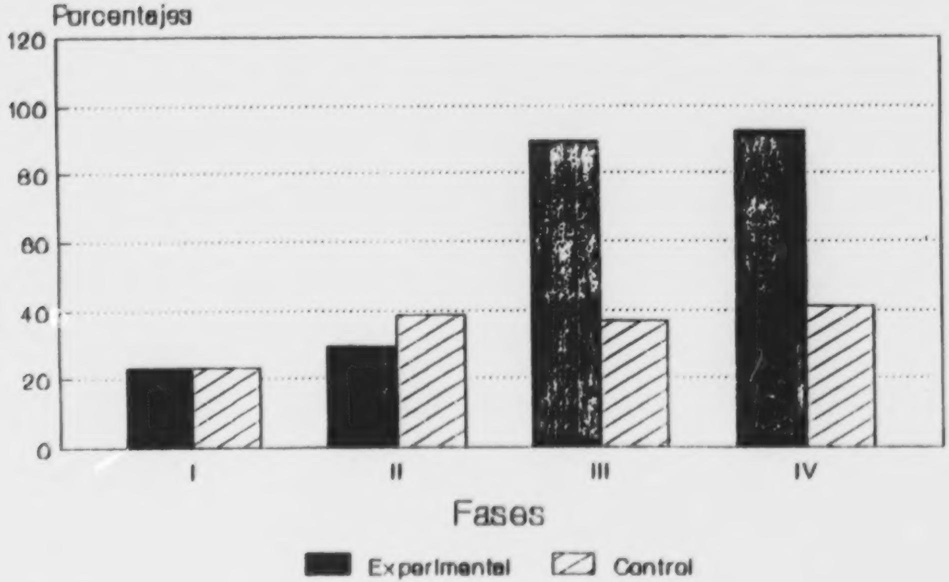

Fig. E_2

Actividad Dirigida

CENTRO DE EDUCACION PREESCOLAR Y PRIMARIA "NUEVOS HORIZONTES"

PROGRAMA DE EDUCACION AMBIENTAL

INVENTARIO DE CONDUCTAS PROTECTORAS DEL TRATAMIENTO ADECUADO DE LA BASURA

NOMBRE:______________________ EDAD:________ GRUPO:________ FECHA:______________

CONDUCTA

1.- Coloca la basura que él produce en el bote de la basura:______________________________

2.- Recoge y tira la basura aunque él no la haya producido:______________________________

3.- Clasifica la basura y le da diferente tratamiento (vgr. orgánico e inorgánico):____________

4.- Cuando no hay depósito de basura disponible:

a) Pregunta por uno:______________________________

b) Improvisa recipiente:______________________________

c) Retiene la basura:______________________________

5.- Tapa el depósito de basura biodegradable:______________________________

6.- Menciona que día pasa el servicio municipal a recoger la basura:______________________

7.- Menciona quién saca la basura doméstica para que sea recogida por el servicio municipal:______________________________

8.- Explica la importancia del buen tratamiento de la basura:______________________________

____

Registró:__________________

CHILDREN AND NATURE IN INDIA

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Abstract

Traditional Indian views of nature and the human-nature relationship differ greatly from modern western views. To study the effects of westernization and modernization on children in India, 681 urban students were given a pencil-and-paper survey. Findings show a need to reevaluate accepted ideas about cross-cultural environmental education.

A recurrent theme in environmental education is the need to consider local conditions when developing programs and materials. In addition to addressing economic and social concerns, education must reflect the local culture in order to be more readily accepted and understood by its intended audience (Knamiller 1978). This means understanding local religious beliefs, folklore, customs and "common knowledge" before attempting any EE program. In particular it is important to understand a peoples' attitudes (beliefs and feelings) about the natural world, and about the relationship between humans and nature. This idea becomes even more crucial in a country like India, where an already diverse assortment of indigenous cultures has undergone recent western influences creating the potential for profound and lasting change in attitudes toward nature.

Methods

To gain an understanding of the attitudes of children in urban India toward nature, an instrument was developed as part of the evaluation procedure for the Children's Environmental Education Television Project (Ettenger 1990). A paper-and-pencil survey with eight biographical questions, 32 agree-disagree-not sure statements and two open-ended questions was developed, pretested and administered to a pilot group of middle school students in Ahmedabad, in January and February of 1989. The 32 items make up six factors that represent various aspects of an overall attitude toward nature. These are: A) feelings of dominance over nature; B) feelings of control/understanding of nature; C) understanding of our dependence on nature; D) awareness of our effects on nature; E) attitudes toward conservation/preservation of nature; and F) attitudes toward animals and plants. Each factor is represented by from four to eight items, with equal numbers of "positively worded" and "negatively worded" statements. The two open-ended questions are "What is Nature?" and "What would the world be like without trees?"

The instrument was developed in English and translated into Gujarati (the regional language). To check for changes in meaning it was then translated back into English by a "blind" reviewer. Any questionable items were reworded in one or both language versions to attain concept equivalence. The instrument was then administered to 681 (403 males, 278 females) sixth, seventh and eighth-standard students from 12 schools in an outlying part of the city. A total of nine English-medium (the language of instruction) classes from private schools, three Gujarati-medium classes from private schools, and three Gujarati classes from government-run (free) schools participated. The survey was administered by the researcher and a translator. All instructions were given orally, as well as being described in the instrument. The survey items themselves were not repeated orally. As much time as necessary was given to respond; the amount of time taken ranged from five minutes for some English-school students to half an hour for a few municipal school students. The purpose of the survey, when it was asked, was explained as wanting to know how students felt about certain things regarding nature. It was emphasized that there were no "right or wrong answers," and that individual responses would not be compared, but that overall class responses would be compared with those from similar classes in Ahmedabad.

Results

Several of the 32 agree-disagree items received strong and similar responses across nearly all groups in the sample (school type, gender, etc.). I call these "universals," but they might in fact be "leading statements." Other items showed large differences between groups (e.g., English medium, Gujarati-private and Gujarati-public classes). In particular, items in factors A (Dominance over nature), E (Conservation/preservation) and F (Animals and plants) reflected this trend. At one end of the scale were English school students, who were less dominionistic and less negativistic and who espoused preservation (see Eagles 1984 for definition of terms). At the other end were students of the Gujarati-public schools. As an example of a dominionistic belief, 64% of this latter group agreed with the statement "Humans should rule over Nature, like a king rules over his kingdom." In contrast, only 17% of the English school students agreed with the statement. Similar responses were given for the statement

"Man is owner of the Earth" (60% of Gujarati-public students agreed, as opposed to 24% of English-school students). Regarding animals and plants, only 8% of English students agreed with the negative statement that "Tigers are dangerous and should be killed"; 84% disagreed. In contrast, 42% of the Gujarati-public students agreed with the statement, while 46% disagreed. For all of the above statements the Gujarati-private students fell somewhere in between the two extremes in their responses. (These are rough generalizations; some schools followed these patterns more closely than others, and there was considerable individual variation as well.)

Another factor in which attitude differences are apparent is Conservation/preservation. The statement "Man can take as much as he wants from the Earth and it will never run out" was agreed to by 53% of the Gujarati-public students and 49% of the Gujarati-private students, but by just 18% of the English students. The item "It is better to use trees now than to save them for later" was agreed to by 71%, 35% and 19%, respectively, of the above groups. Items representing other factors showed similar but somewhat weaker responses. The general picture shows students in English-medium classes as less dominionistic, less negativistic, and more inclined toward conservation and preservation of nature than students in either the Gujarati public schools or the Gujarati private schools, although differences with the latter group were less pronounced (and within one school, even reversed). In addition, English-medium students were more aware of the effects of human actions on nature and our dependence on nature, while expressing a slightly greater belief in our ability to one day understand and/or control nature. In sum, students in these schools seemed to have the most "Western" views of nature, as well as the highest levels of concern for the maintenance of natural systems.

Conclusions

In modern Indian cities, the hierarchy of society traditionally determined by caste is now determined by economic class (although the two are not unrelated). Effectively this means that some children will be able to attend "quality" schools and receive a (value-laden) western-style education, typically in the English language; others will be constrained to schools of somewhat lesser quality that teach in the regional language, or to no school at all. (Evidence about the quality of schooling was found in this study, based on apparent levels of reading comprehension and conceptual maturity of responses.)

Ideas about nature and attitudes toward the environment in large part result from experiences in and out of the classroom_experiences that are bound to differ greatly across lines of class, language and place of residence. This study shows that such attitudes vary greatly even within a specific region of one city; rural-urban and regional variations are likely to be considerably greater. Yet many environmental education materials being developed at the national level are assumed to be applicable across various Indian cultures with little adaptation. Likewise, materials and techniques developed in the west are loosely "adapted" and applied with little thought to their appropriateness and without fully understanding the underlying cultural values of either the audience or the materials themselves.

Just as technology is not "value-neutral," neither are educational materials nor, for that matter, the theories of learning upon which they are based. This calls into question the very concept of "cross-cultural" application of materials. At the least, more emphasis must be placed on understanding the background, learning level, language and prevailing attitudes of the intended audience before developing and using environmental education materials. Finally, no amount of educational planning will be sufficient if certain standards of living cannot be attained by the growing numbers of rural and urban poor. It is a very real possibility that currently accepted ideas will help create an environmentally literate urban elite while letting the underprivileged suffer growing environmental injustices deafly and mutely.

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CLASSROOM APPLICATIONS OF TECHNOLOGIES FOR GLOBAL CHANGE EDUCATION

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Abstract

Demonstration of how remote sensing, on-line databases, CD-ROM and other technologies used by scientists can be adapted for high school classrooms. Reports how curriculum development and teacher training projects supported by NSF and the Eisenhower Program are providing innovative approaches to teaching about interdisciplinary aspects of global environmental change.

Developments in science and technology are occurring so rapidly that environmental educators have difficulty keeping up with current issues and events. It is especially difficult for teachers to maintain current information in fields outside their immediate training. This is because of unfamiliarity with resource bases and lack of familiarity with the "big thinkers" and current issues in those fields. The problem is compounded when we consider interdisciplinary sciences and their ties to social concerns, such as in the many facets of global climate change.

Global sciences as an integrated focus are receiving international attention as it becomes urgent to monitor changes inflicted on our planetary environment by human lifestyles. In Congressional testimony in May 1989, NASA emphasized the critical need for international cooperation on modeling earth processes, basing models on what can be determined about the global environment from bases in space. NASA has under construction three satellites to collect data on global change. Much information is already available from remote sensing, and groups such as the American Society for Photogrammetry and Remote Sensing are attempting to make government agencies and resources using industries aware of applications of remote data for real world needs. For information for the current projects, the authors worked closely with Ohio State's Byrd Polar Research Center, which is using remote data for studies of global sea level changes, the historic climates, and atmospheric CO_2.

Unfortunately teachers who wish to utilize such data in the classroom find that (if it can be located at all) it is either an unusable, or difficult to interpret and apply. For technologies to be useful in education, they must 1) empower learners, 2) extend what can be done with existing human networks, 3) be meaningful, 4) provide a product faster than by traditional means, and 5) be a flexible tool that is compatible with existing tools. These requirements provide special challenges when secondary educators delve into the information sharing methods of scientists and government resource agencies.

It is difficult but not impossible with existing school computers to gain access to databases that have been synthesized by government agencies for such topics as marine toxic substances and pollutants, atmospheric constituents, environmental atlases and supporting databases. NASA, for instance, has a teachers' electronic network providing information about near space. Digitized images can be developed for the same computers, and even the information that is best used in photographic forms can be made available to educators as NASA has done in its Mission to Earth and its "Oceanography from Space" materials. NOAA is scrutinizing its databases to determine which could become interactive for educators. The US Geological Survey is developing a CD-ROM specifically for teachers to integrate a variety of data about the Yellowstone fires.

If science and math teachers are taught how to access and interpret such information and how to apply it in their existing curricula, the educational community can advance on three fronts. First, the curriculum can reflect global trends through integration of the sciences and mathematics with social issues. Second, classroom computers, which are frequently serving as high-tech typewriters, can be put to more effective use within the subject areas, so that technology becomes the tool for meaningful study rather than the object of study. Finally, students beginning in the middle school years will learn about critical world happenings that will impact the planetary future. Appropriate teaching strategies can aid in establishing a sensitivity to the role of individuals in affecting global change.

Two projects conducted by the authors at The Ohio State University are addressing these challenges. A grant from the Ohio Board of Regents applies funding from the Eisenhower Math and Science Education Act to introduce teachers to the technologies that scientists use to study global change, and one from NSF is developing secondary science curriculum modules for global change education. Together these efforts involve teachers, scientists and environmental/science educators. Products will be available nationally and will include case studies, image interpretation on a basic level, time series activities charting changes throughout earth history, use of data from diverse sources to answer interdisciplinary questions, and data-sharing activities for multiple schools.

With the cooperation of Worthington City Schools and other science teachers in central Ohio, these projects are proceeding as follows. A University seminar presented with the cooperation of the Byrd Polar Research Center, OSU Center for Mapping, and various other science departments, introduced current topics in biological and earth systems. All scientists in the seminar were studying some aspect of global changes and human response to them. They were also users of either a form of remotely sensed data such as satellite imagery or aerial photography, or Geographic Information Systems (GIS), or on-line databases that could be adapted for access by schools. Project staff are working with the originating agencies and with adaptating of the materials to make more of these technologies available in a usable form.

At the NAAEE Annual Conference in 1990, lists of available databases and CD-ROMs will be distributed and demonstrated. Environmental educators will be introduced to methods of acquiring and using the data for global change education.

During the remainder of the projects, teachers will work on curriculum development with scientists and science educators to adapt seminar information for use with the technologies available to the classroom. Materials will be tested in high school classes during 1990-91 and disseminated at cost through professional organizations and the University.

COLORADO RIVER WATCH NETWORK: A COMPARATIVE STUDY OF THE EFFECTS ENVIRONMENTAL FIELD STUDIES EXPERIENCE ON CAREER CHOICES AFTER HIGH SCHOOL

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A longitudinal analysis of the careers chosen by members of the Appleton East High School-Science Club who won the 1973 club-of-the-year award from the Wisconsin *Academy of Science, Arts and Letters.* Comparisons are drawn between the current Colorado River Watch Network of Austin, Texas and the field experience of the students in Wisconsin.

CONSERVATION EDUCATION IN BELIZE AND COSTA RICA: A SYSTEMS MODEL APPROACH FOR EVALUATION

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The Context-Process-Product system evaluation model provides feedback for making decisions about the development, implementation, and outcome of conservation education programs. Examples such as reforestation projects, zoo outreach programs, farmers' newsletters, and school ecology programs in Belize and Costa Rica are presented to demonstrate the usefulness of the model.

EDUCATING ENGINEERS TO PREVENT INDUSTRIAL POLLUTION

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Abstract

The Waste Minimization Assessment Center program began during 1988, sponsored by EPA and managed by University City Science Center. Engineering faculty and students under contract to UCSC show small and medium-sized manufacturers how to reduce waste generation and analyze cost savings. Proven financial incentives represent the motivation.

Educational Mission And Method

To eliminate or reduce industrial waste formation at its source is the primary mission of the Waste Minimization Assessment Centers (WMAC). The secondary mission of these WMACs is for the faculty to educate students through the services provided in the plants of small and medium-sized manufacturers.

It has been claimed that the WMAC program is the most efficient means known for educating students in reduction of industrial waste. This paper will present information to support that claim and to illustrate the kinds of results obtained.

In 1988 we began a pilot project to assist small and medium-size manufacturers who want to minimize their formation of hazardous waste but who lack the in-house expertise to do so. Under agreement with the Risk Reduction Engineering Laboratory of the U.S. Environmental Protection Agency, we established two WMACs at Colorado State University and University of Tennessee which then became subcontractors to University City Science Center. Late in 1989 we began a third at Louisville. Manufacturers served meet the following criteria:

- Standard Industrial Classification Code 20-39.
- Gross annual sales of $50 million or less.
- No more than 500 employees.

The methodology is built upon concepts we developed while managing a similar program to improve industrial energy efficiency. In that program, a working knowledge of manufacturing processes has been a more significant asset for the participants than any special expertise in energy use. Similarly, the faculty and students in the WMAC program build upon their scientific and technological knowledge and learn to apply it when they visit industrial plants, collect data, and then develop specific recommendations to show manufacturers how to lower costs by reducing waste formation and emission.

Participating students may have taken one or more environmental courses available in some university departments, but most have not. They acquire their training on the job--from the faculty and from their student predecessors. Usually an undergraduate student spends the equivalent of at least one academic year in the program but some work on it longer, and there is never a total turnover of students at one time. The distinguishing characteristic of the WMACs is their focus on waste reduction in manufacturing operations, rather than a concentration upon health and safety issues or waste treatment and disposal.

To illustrate the effectiveness of the WMACs we offer these results from two plants.

Results

PLANT No. 1 (SIC 2851)

This plant produces paints, coatings, and stains at an approximate rate of 1.1 million gallons/year on a schedule of 2080 hours/year.

Plant Operations

Individual lots of water-based and solvent-based paints are mixed in a variety of tanks from 200 to 1000 gallons' capacity. Ingredients for this initial step include (for water-based) water, latex, resins, extenders, and dispersed pigments. For solvent-based paints the materials are generally similar in type, but solvent replaces water and latex, and the other ingredients include plasticizers, tints, and thinners.

After batches are made up they are transferred to let-down tanks, where additional water (or solvent), resins, preservatives, anti-foaming agents, thinners, and bactericides are added. Testing of batches encompasses color, viscosity, and gloss. Those lots which meet specifications are filtered and charged to cans for labeling, packaging, and shipping.

The principal waste streams are the result of equipment cleaning, especially from water-based paints. For example, rinsing the let-down tanks ordinarily requires 35 gallons of water, but that value increases to 53 gallons if light paint is to be blended after a dark predecessor. The hazardous nature of water rinses is due to mercury from the bactericide in the paint.

In some instances, rinse water from the mixing tanks is held in 500-gallon tanks and used in the let-down tanks (instead of fresh water) to formulate future batches of water-based paint. The rinses are separated according to the color intensity of paint in the tanks from which they were derived. For example, rinses from white paint formulation amount to about 70% of the total, and they are invariably used again.

Waste rinses not used again are piped to holding and flocculation tanks, to which alum is added to lower the pH, in which some solid is precipitated by adding flocculent, and from which supernatant liquid is removed for re-use in other paint formulations.

Waste Minimization Opportunities

Table 1 summarizes the principal sources of waste, their amounts, the management method applied, and the associated costs.

Table 2 offers a brief description of each recommended Waste Minimization Opportunity (WMO) and of current plant practice, together with savings and cost data. Considered individually, the three WMOs recommended could save over $22,000/year, which represents about 25% of current waste management costs. Each has a simple payback time less than one year.

PLANT No. 2 (SIC 3443)

This plant manufactures aluminum brazed oil coolers for use in heavy equipment. It produces approximately 59,290 units each year.

Manufacturing Operations

The raw materials used include aluminum in sheet and coil form, aluminum castings and extrusions, tubes, fittings, brackets, labels, and plugs.

The following steps are involved in production:

- Shearing, punching, and forming operations to fabricate the oil cooler tanks, headers, air fins, sides, and oil turbulator fins.

- Degreasing of oil cooler tanks, headers, sides, fittings, and brackets. The solvent Chlorothen (95% 1,1,1--trichloromethane) is used in an open-air, steam-heated vapor degreaser. The unit is equipped with a refrigeration unit which condenses Chlorothen vapor and minimizes evaporative losses.

- Recycling of spent Chlorothen to the degreasing operation using an on-site still. Chlorothen is continuously circulated between the degreaser and a steam-heated solvent recovery still. Still bottoms are shipped off-site as hazardous waste.

- Brazing of assembled oil coolers to join the internal and external coil fin surfaces for enhanced heat transfer. The oil coolers are first preheated in a gas-fired oven and then dipped into a molten salt bath containing a sodium chloride-based compound, lithium chloride, and aluminum fluoride, and finally dipped in a quench tank. Sludge from the salt bath and quench tanks is put in the on-site sand filter bed. Solids remaining in the filter are landfilled on company property; water is fed to the settling pond and eventually discharged to a river.

- Cleaning of oil coolers to remove residual salt, expose copper cells (which could cause corrosion failure), and condition metal surface prior to painting.

- Treating of spent process solutions and contaminated rinse water. The liquids are treated in a neutralization tank with lime for pH control and flocculent to enhance removal of suspended solids. The solution leaving the tank is pumped to a clarifier which removes solids and allows filtered water to flow to the settling pond. A solids-rich stream is pumped to a sludge-thickener settling tank for secondary sedimentation. Supernate from the settling tank is transferred to sand filter beds for final water removal before on-site landfilling of solids.

- Treating of effluent from the chromic acid and de-ionized rinse water washes to reduce hexavalent chromium to less toxic trivalent chromium.

- Painting of oil coolers.

Waste Minimization Opportunities

The waste currently generated by the plant and its source, quantity, and annual treatment and disposal costs are given in Table 3.

Table 4 shows the WMOS that WMAC recommended for the plant. It describes the waste in question, the minimization opportunity, the possible waste reduction and associated savings, and the implementation cost along with the payback time.

Discussion Of Results

The two plants described have annual waste management costs of $188,370 and the WMACs were able to recommend cost-saving measures which add up to $359,980 per year. The savings total exceeds the aggregate waste management cost because, in one of the plants, the measures recommended save more than the cost of waste treatment, disposal, and recycling.

At plant No. 1, all of the recommendations were implemented within two years of the assessment, for a total cost saving of $11,526/yr in waste management and $10,584/yr in raw materials. Some of the recommendations at plant No. 2 were options, and therefore not all could be implemented. Of the $47,958/yr identified in potential waste management cost savings, $28,871/yr has been implemented (60.2%). Raw material cost savings implemented amount to $199,370/yr, which represents 68.4% of the $291,528 identified.

Acknowledgment

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TABLE 1. SUMMARY OF WASTE GENERATED (SIC 2851)

WASTE STREAM	WASTE TREATMENT Amount	WASTE TREATMENT Cost	WASTE DISPOSAL Amount	WASTE DISPOSAL Cost
HAZARDOUS LIQUID WASTE				
A. Water-based Waste:				
Equipment cleaning by water washing	26.700 gal (Hg water and paint)	$3.740	26.700 gal off-site	$48.040
B. Solvent-based Waste:				
Equipment cleaning by solvent washing			27.200 gal (mineral spirits) off-site	$37.080
TOTALS	26.700 gal	$3.740	53.900 gal	$85.120

TABLE 2. SUMMARY OF WASTE MINIMIZATION OPPORTUNITIES RECOMMENDED (SIC 2851)

WMO No.	Present Practice	Proposed Action	Cost Savings
1	Water rinses remove paint from tanks and pipes	Install a pipe-cleaning system consisting of 3 different-sized foam plugs or "pigs" to be sent throughout the pipes by compressed air. Paint is thus forced from the lines and to the canning line filter. The use of water and amount of waste are lower. (This WMO is applicable to non-white paints.)	Estimated waste reduction = 1,780 gal/yr Estimated cost reduction = $11,110/yr Estimated implementation cost = $1,600 Simple payback = 2 months
2	About 15 gal solvent per batch of paint is drummed and sent off-site for disposal	Use a solvent recovery system based upon distillation and ship the small amount of remaining solid to a hazardous waste disposal site.	Estimated waste reduction = 3,300 gal/yr Estimated cost reduction = $5,420/yr Estimated implementation cost = $4,950 Simple payback = 11 months
3	A bactericide containing mercury is being used in water-based paints.	Eliminate the bactericide from water-based interior paints and substitute an organic material. (This WMO is applicable to non-white paints.) There is no cost difference between these additives.	Estimated waste reduction = 3,100 gal/yr Estimated cost reduction = $5,580/yr Estimated implementation cost = none Simple payback = immediate

TABLE 3. SUMMARY OF WASTE GENERATED (SIC 3443)

Waste Generated	Source of Waste	Quantity Generated	Annual Waste Management Cost
Still bottoms containing spent, contaminated Chlorothene (95%-1,1,1-trichloroethane), water, and oil.	On-site solvent recycling still associated with the degreasing operation.	150 gal/yr	$4,650
Evaporation of Chlorothene.	Degreasing operation.	6,525 gal/yr	0(a)
Sludge containing compounds derived from the salt bath constituents, impurities from the baths, and contaminants on the products' surfaces.	Salt bath tank and water quench tank in the brazing process. The sludge is collected on the sand filter beds.	514,917 lb/yr	28,500
Sludge containing various solids from the treatment of the spent cleaning solutions.	Treatment process for spent solutions from the cleaning of the brazed product. The sludge is collected on the sand filter beds.	1,171,060 lb/yr	36,375
Sludge containing various compounds from the chromium reduction process.	Chromium reduction process. The sludge is collected on the sand filter beds.	88,943 lb/yr	16,500
Paint-contaminated filters and cardboard and plastic sheets.	Painting of product.	9,812 lb/yr	13,485

(a) Currently there are no waste management costs associated with the evaporation of Chlorothene.

TABLE 4. SUMMARY OF WASTE MINIMIZATION OPPORTUNITIES RECOMMENDED (SIC 3443)

Part I

Waste	Minimization Opportunity	Waste Reduction Quantity	Waste Reduction Per Cent	Net Annual Savings	Implementation Cost	Payback Years
Evaporation of Chlorothene from the degreaser unit.	Install a conveniently removable cover on the vapor degreaser tank to reduce evaporative losses. Cover the tank except during times when parts baskets are being lowered into or taken out of the tank.	3,263 gal/yr	50	$17,180(A)	$220	0.01
Still bottoms from the on site solvent recycling still.	Reduce the amount of lubricants used during metal working and the openness of machine work areas to decrease the amount of oil picked up by parts during processing, thereby minimizing the amount of degreasing required.	30 gal/yr	20	1,010(A)	290	0.3
Evaporation of Chlorothene and Chlorothene contained in the still bottoms.	Replace the vapor degreaser system with an ultrasonic cleaning system which utilizes biodegradable detergents.	6,600 gal/yr	99	20,450(B)	50,000	2.4
Sludge from the water quench tank in the brazing process.	Modify the procedure for dipping the coolers in the salt bath to minimize carry over to the water quench tank. Achieve maximum salt removal by gently vibrating or shaking the parts baskets and subjecting the parts to a hot air blast.	23,171 lb/yr	4	20,520(C)	43,880	2.1
Sludge from the salt bath and water quench tanks in the brazing process.	Replace molten salt bath brazing with vacuum brazing. Vacuum brazing is suitable for 80% of this plant's products.	411,934 lb/yr	80	203,440(C)	720,640	3.5

TABLE 4. SUMMARY OF WASTE MINIMIZATION OPPORTUNITIES RECOMMENDED (SIC 3443)

Part II

Waste	Minimization Opportunity	Waste Reduction Quantity	Waste Reduction Per Cent	Net Annual Savings	Implementation Cost	Payback Years
Paint contaminated cardboard and plastic sheets.	Reduce paint loss by installing a low pressure air jet system over the paint dipping area to blow excess paint downward into tank. Install an IR paint-drying lamp to prevent dripping when coolers are moved to the spray booth area.	2,180 lb/yr	22	4,350 (D)	2,490	0.6
Paint contaminated filters and cardboard and plastic sheets.	Install an electrostatic spray paint system for application of the oil cooler second coat of paint in order to reduce overspray loss.	3,513 lb/yr	36	11,200 (D)	13,200	1.2
Paint contaminated filters and cardboard and plastic sheets.	Discontinue the practice of painting oil coolers which will be re-painted by the customer.	4,906 lb/yr	50	59,720 (D)	28,440	0.5

(A) Includes cost savings attributed to the avoided purchase of Chlorothene.
(B) Total savings have been reduced by the cost of detergents required.
(C) Includes cost savings attributed to the avoided purchase of salt bath constituents.
(D) Includes cost savings attributed to the avoided purchase of paint supplies.

GET YOURSELF PSYCHED UP:
PSYCHOLOGICAL TECHNIQUES FOR EDUCATORS

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Abstract

Current research in the field of environmental psychology has important implications for educators. The information processing model will be presented as a method of understanding how humans interact with the environment. Effective techniques will be analyzed to enable educators to adapt this approach to their own style to increase student learning and retention.

Environmental education (EE) can be defined to be, "aimed at producing a citizenry that is knowledgeable concerning the biophysical environment and its associated problems, aware of how to help solve these problems, and motivated to work toward their solution" (Disinger 1983). Now two decades since its inception, it is generally acknowledged that EE has helped increase our awareness and knowledge of the environment. However, there is much more debate as to whether EE has caused an increase in pro-environmental behavior. This gap between awareness and action is seen by environmental educators when they observe the same environmentally negative behavior after an EE program as before. Education alone is clearly not sufficient to change behavior. What will help strengthen the relationship between awareness and action?

Many times educators initially attempt to answer this question by searching for the "perfect lesson" that will motivate students to change environmentally destructive behaviors. Professional EE curriculum writers have aided this quest by churning out large amounts of EE materials. But as with many aspects of present society, we are beginning to realize that more is not necessarily better, and one specific curriculum will not be enough to change behavior (Simmons 1989).

Perhaps the crucial weakness in the attempts of EE to turn awareness into action does not lie in the curriculum itself. Changing how we present material or teach could generate an equal or even greater degree of success. In this endeavor, environmental educators might benefit significantly by examining what other academic disciplines can tell us about how humans process and retain information.

This paper will look through the lens of a specific discipline, environmental psychology, which could provide environmental educators with an alternative perspective for designing and teaching EE lessons or programs, for determining appropriate teaching techniques, and for evaluating the program's success in changing negative behavior patterns to positive ones.

The concepts discussed below are not startling revelations, they are for the most part "common sense" ideas that environmental psychologists have researched and found to have merit. The ideas are appropriate for all populations and types of educational settings since we are describing how humans in general react to new information they receive. All the ideas mentioned are structured to help environmental educators answer the question, "How Can I Design A Learning Opportunity?"

The Lesson Or Activity Should Tie Into The Participants Cognitive Maps

Everyone has a mental model of reality, or cognitive map, in his/her mind that enables them to store information about past experiences and feelings about the experiences. As we grow older and experience more (either directly or second hand) our cognitive maps form more complex networks. This network enables humans to interconnect related experiences to be familiar with a wider variety of situations, and to predict what will happen in settings that are similar to past experiences. Since cognitive maps represent our highly individual past experiences and thoughts, the maps cannot be directly transferred from one person to another.

In order for the concepts within each lesson to be integrated into the student's pre-existing cognitive map in a specific manner, educators should take time at the beginning of the lesson to become familiar with each learner's map. Since few environmental education lessons are taught individually, the educator must be able to identify common traits in individual maps and base the lesson on these shared experiences. Assessing the nature of or level of complexity of an individual's map does not need to be time consuming or difficult. It could be as simple as asking students about their past experiences in a similar setting.

An excellent example of linking a lesson to a shared cognitive map is described by Charles A. Lewis (1982). Lewis was introducing a group of inner city teenaged boys to the Morton Arboretum. The boys were apprehensive about entering what to them was an unfamiliar, intimidating jungle environment. Lewis diffused their nervousness by asking the boys to describe a familiar environment, their city. The boys told him what their urban city looks like and how it works. Once Lewis understood the students map for their home environment, he showed the boys how "Nature City" has many of the same features as their urban neighborhood. For instance, the boys discovered that both cities have different types of neighborhoods (or environments) and a variety of residents live within each neighborhood.

If environmental educators don't provide students with specific links between new information and the information that is already encoded in the student's map, the student may attempt to provide their own connections in strange and sometimes amusing ways.

Here is an example of a teacher who did link the overall concept to information in the students map, but failed to show the connection between each piece of new information and the students prior knowledge. This elementary teacher was not comfortable teaching science, but she knew she needed to teach science, so she decided to teach her students about plants. It seemed like a simple, non-controversial subject. She knew that the information she was presenting should be related to familiar concepts.

She began her plant lesson by telling the students how plants and humans are alike; they both have support systems (skeleton, heartwood), they both need water to grow, etc. It was going very well until a boy raised his hand and asked the teacher, "how do plants go to the bathroom?" The teacher had not thought that students would make connections on their own between plant processes and human body functions. The student's question showed the teacher that he understood the connections she was making, and was trying to link the new plant information with similar, already encoded, body function information. Unfortunately, the teacher was embarrassed by the boy's question and ended the lesson rather abruptly.

Recognize Capacity Limitations

Everyone knows that there is a limit to how much new information can be retained, but just how much is too much? Many environmental psychologists believe that our active memory can only attend to 5 + 2 chunks of new information at one time. New and conflicting information or stressful environments can further reduce the number of information chunks able to be processed. For most situations the optimal number of chunks is three (Kaplan and Kaplan 1982).

Information overload results in confusion, frustration and mental pain which often causes the individual to avoid the situation. This can have serious implications if the goal of an EE activity is to increase knowledge about environmental problems, but ends up presenting too much information which overwhelms the audience and causes them to avoid any future EE activities.

If people being taught about ecological processes are presented with too many individual steps, they may remember the most salient features and forget the middle steps. The importance of presenting limited amounts of new information (especially if the learners are in an unfamiliar environment) became obvious to me during a lesson with first graders.

The children and I were in a cow pasture discussing the food chain. I showed them the cow manure, and we talked about how the manure helped the grass grow, the grass was eaten by the cows, the cows were milked by the farmer, and people made milkshakes with the milk. The next morning one of the student's mothers came up to me and mentioned how her son told her that we made manure milkshakes in class. Luckily the parent had a good sense of humor and knew that we had not really made the shakes. Since the lesson contained more than the optimal three bits of new information, her son had remembered the information that was most important to him--the manure and the milkshake.

There are other environmental psychology theories and current research studies that may be of interest to environmental educators. Environmental psychologists are studying or have studied conservation behavior and different types of motivation, the impact of barriers to pro-environment behavior and the psychological role of natural environments. Environmental education will need to understand more about the same topics that environmental psychologists are addressing as the need to have people act in environmentally positive ways becomes greater due to fewer resources and higher human populations.

Environmental psychology is only one example of a discipline that can help environmental educators be more successful. Other academic areas such as public health, educational psychology, and urban planning may provide insight to environmental educators. Just as the content of EE is interdisciplinary and draws from many different disciplines, so should the theories behind EE lesson design, teaching methods and evaluation be assimilated from a wide range of legitimate areas.

End Note

For the purposes of this paper, environmental psychology is defined as, "the study of the interrelationship between behavior and the built and natural environment" (Fisher, Bell and Baum 1984).

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ENVIRONMENTAL PROTECTION VERSUS ECONOMIC INTERESTS: A TEST OF SITUATIONAL COMMUNICATION THEORY AS A PROBLEM-SOLVING APPROACH

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Grunig's (1983) situational communication theory is used as the basis of a study which examined the influence of information seeking and processing through mass media and interpersonal information sources on the development of environmental awareness and behavior among residents in a region plagued by the environmental protection versus economic interest controversy.

INTERPRETING AND APPLYING RESULTS OF RESEARCH ON RESPONSIBLE ENVIRONMENTAL BEHAVIOR

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Studies of responsible environmental behavior (REB) have been conducted in numerous fields, using differing models of behavior. Consequently, the interpretation, integration, and use of results from studies requires careful analysis of them. This session will review several models as a basis for interpreting results and educational implications of selected studies.

SOCIALIZATION INTO ENVIRONMENTALISM

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Abstract

A survey of college students revealed that those with more positive environmental attitudes than their peers were also more likely to engage in environmentally proactive behavior. Experiences and preferences which might be formative influences on environmental attitudes also differentiated these students. Implications for environmental education are discussed.

The majority of Americans are "sympathetic" to the environmental movement but only ten percent consider themselves "active" (CEQ, 1980; Mitchell, 1980). How do some people become environmentalists while the majority do not? An assumption of many environmental educators is that personal experiences of nature, especially during childhood, promote positive feelings and attitudes toward the natural environment. For example:

> To have a relationship with nature, young children must have meaningful personal experiences with natural elements and other species. ...The intensity of the relationship, physically, emotionally, and mentally, is the foundation for caring for the world and the basis for responsible action (Roger Tory Peterson Institute, 1989, p. 5).

There is some evidence to support this assumption in nature literature, as well as from reported influences on conservation leaders (Tanner, 1980) and from short-term educational programs (Driver, 1983/84). However, no previous study has investigated the long-term effects of personal experiences comparing environmentalists to other groups.

This study drew on the work of social scientists who have documented the range and intergroup variation of attitudes toward the environment and technology. Dunlap and Van Liere (1978) undertook a survey to determine the extent of public acceptance of a new worldview incorporating such ideas as limits to growth, preserving the balance of nature, and human harmony with nature. The survey revealed the general public accepted the New Environmental Paradigm (NEP) to "a surprising degree" but significantly less than those who belonged to environmental organizations. Milbrath and his colleagues (1984) conducted an international survey of the attitudes of the general public and various elites toward the environment, technology, and economic growth. They found clusters of values ranging from environmentalists who were a "vanguard for a new society" to a rearguard which most strongly supported the Dominant Social Paradigm (DSP) discussed earlier by Dunlap and others. The majority of environmental elites believed limits to growth exist, perceived environmental conditions as a large problem, and favored social change rather than technology to solve environmental problems, but only eighteen percent of the public and less than five percent of business leaders held this cluster of attitudes. Mitchell (1980) surveyed members of five national environmental organizations and found over 80% approved of alternative soft technologies, disagreed that plants and animals exist primarily for human use, and believed endangered species should be protected even at the expense of commercial activity.

Several sociologists have suggested that sector or type of employment is more highly correlated with environmental attitudes than are traditional socioeconomic measures (Buttel, 1975, 1987; Cotgrove, 1982; Rhyne and White, 1988). There is evidence that professionals in business management and engineering hold attitudes (humans-over-nature, pro-technology, pro-growth) which are counter to environmentalism even more strongly than the general public (Yankelovich, 1982; Milbrath, 1984).

Respondents' attitudes toward the environment, growth, and technology.

College seniors in environmental studies (ES), business, and engineering were sent a survey and 59% responded (n = 212). Students' attitudes were generally consistent with what might be expected of workers in the students' chosen field or profession. There were significant differences among the groups on the mean scores of all attitude questions except one: Students in all majors agreed that "interference with nature often produces disastrous results". ES students were in greater agreement with the statements "we are approaching the limit of the number of people the earth can support" and "there are limits to growth beyond which our industrializod society cannot expand" and were more likely to think "changing our lifestyles" was a better long range solution of environmental problems than "developing better technology". There were no significant differences between engineering and business students on these three questions. ES students disagreed that humans have the right "to use plants and animals in any way necessary to satisfy societal needs", significantly more so than business students; engineering students were not significantly different from either. The survey also elicited attitudes toward large-scale or high technology. Engineering students more strongly agreed that "more nuclear power plants should be built" and that "the benefits of genetic engineering outweigh the negative aspects" than other students. ES students indicated greatest disagreement, but the differences between ES and business students on the two questions were not significant.

Factor analysis revealed two underlying factors (environmental and technological dimensions) which accounted for forty-seven percent of the variance in the responses. When responses were standardized, analysis of variance showed that the variable "major" alone accounted for the largest proportion of variance in the environment factor (14%) and in the technology factor (17%). ES students differed significantly from business and engineering students on the environment factor and there were significant differences among all three majors on the technology factor. Comparatively, ES students were most "pro-environment" and "anti-technology", engineering students were most "pro-technology", and business students were "anti-environment" and "anti-technology".

There was a significant gender-major interaction on the technology factor; females in ES and business were more anti-technology than their male peers but there were no gender differences in engineering. Among business students, women were similar to ES students (anti-technology) while men did not differ from engineering students in their attitudes toward technology. Because men dominate business management (Bonfield, 1980), business will continue to be pro-technology until women enter management in proportions similar to their college enrollment in business majors.

Among the three groups, there was often a commonality, or overlap, of socialization experiences, from perceived parental and peer agreement with respondents' attitudes to participation in some organizations and activities. Nonetheless, differences existed in experiences, as well as in current activities and attitudes. These differences formed clusters which were associated with different majors.

The majority of ES students had a life-long experience of the natural environment, more so than other students. They had preferred exploring or adventuring as children (57%) and had enjoyed natural areas for solitary play (69%). During junior high school, most had spent time in natural settings (79%) and virtually all had personally enjoyed natural settings rather than community settings such as malls (94%). In high school, biology was the favorite course of many of these students (40%). During college, they participated in more outdoor activities than the other students and the large majority participated in nature appreciative activities (camping and hiking, 81% and 85% respectively), belonged to environmental organizations (62%), and were active on environmental issues (75%). Few belonged to fraternities or sororities (12%) or career-related organizations (31%).

Although many engineering students had also preferred exploring/adventuring as children (39%), an equal proportion preferred construction activities (33%). A majority had preferred natural areas as children (53%) and three-quarters had spent time in and enjoyed natural settings as adolescents. The large majority had preferred high school courses in the physical sciences and mathematics (73%) and this group was least likely to have preferred non-science courses. Although about half of these students camped or hiked, equal proportions skied or participated in team sports. The majority belonged to career-related organizations (68%) and about one-fifth belonged to fraternities or sororities, but few belonged to environmental (5%) organizations or were active on environmental issues (11%).

Many business students had preferred high school courses in business or social science (40%) and were much less likely to have preferred science than ES or engineering students. As a group, their interests were social or socially competitive. Almost half belonged to fraternities or sororities (46%); as children many had preferred group sports (41%) and the majority participated in team sports in college (55%). These students had the least experience and interest in natural settings. Fewer preferred play in natural areas as children (40%) and more spent time in community settings as adolescents (45%) although they were as likely as engineering students to have personally enjoyed natural settings. Only a third of business students camped or hiked. Like engineering students, the majority belonged to career-related organizations but few belonged to environmental organizations or were active on environmental issues.

In summary, students who had preferred exploring/adventuring were more likely to have also preferred natural areas for solitary play as children and to have spent time in and enjoyed natural settings during junior high school. Although positive feelings toward nature did not appear to directly influence attitudes toward technology, they did appear to influence environmental attitudes and behaviors. Those who had enjoyed natural settings were more likely to have positive environmental attitudes, to be ES students, to belong to environmental organizations, and to be active on environmental issues. In contrast, those who had preferred other activities and places (e.g., group sports, community settings) were more likely to be business students, to have less positive environmental attitudes, and fewer were environmentally active. Pro-technology attitudes were most strongly influenced by formal education (preference for mathematics and physical science and majoring in engineering) and by being male.

These findings suggest two complementary approaches to promote positive environmental attitudes and behaviors: 1) Provision of open space areas which allow children, and adults, to explore and develop an appreciation for nature; and 2) Increased discussion of the social and environmental effects of science and technology in physical and social science courses at all educational levels.

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CONVERTING "IT'S NO USE" INTO "HEY, THERE'S A LOT I CAN DO!" A MATRIX FOR ENVIRONMENTAL ACTION TAKING

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Abstract

Our efforts to teach students about environmental issues too often breed hopelessness and helplessness, neither of which empowers students to action. Analyzing examples and strategies of environmental action helps build imagery of the possible and may inspire students to follow suit. A matrix designed to uncover multiple avenues for influencing action will be presented.

The impressive sales of the new "how you can save the world" books indicate the growing awareness and concern for environment and natural resources. This interest is reflected in other evidence of changing public sympathies: more reporters cover environmental stories, more businesses are 'green,' and more students register for courses in environmental studies. Unfortunately for the students, the courses are all too often an overwhelming dose of what the problems are, how our comfortable lifestyle makes them worse, and how the complexity of the issues makes solving them difficult.

This is unfortunate, because as long as we continue to frame environmental issues in terms of the problems, greater student knowledge often leads to deeper student despair. "These problems are so huge, there's really nothing I could do to solve them; why should we bother to try?" many comment as their new interest is flooded by the frustration of helplessness and hopelessness. Such emotions do little to empower people to action (Maier and Seligman 1976). Further, depression and despair often effectively snuff out the initial spark of interest (See End Note).

Recognizing that a "doom and gloom" message does not win many followers, some teachers and some textbooks have begun tossing in examples of successes and stories of "people making a difference." Other courses explore a case study in depth, following every twist and turn of environmental action taking. While these teaching strategies do not steer students toward hopelessness, neither do they help students understand the problem and possibilities so well that they can take action on their own. To be environmental action takers, students must grasp the situation with a sense that they can handle the problem; their familiarity must be great enough to allow them to explore avenues for various actions. This means they need more than facts or even heartwarming stories; they need a mental model of the problem and possible alternatives. Further, they need a mental model that they are so familiar with that they can move about with comfort and facility.

A Bit of Background

The process of building a mental map or model in learners heads is not easy or explicit. The amount of information necessary to give learners confidence in what they know varies. Certainly somewhere between the cursory sketch of a novice and the packed map of an expert constitutes the realm of adequacy, but that hardly limits the possibilities. Not only the amount, but also the presentation and structure of that information are critical during map-building. The following two clues about cognition, however, provide guidance.

1. We need examples. Mental models are constructed from repeated experiences and examples. From these examples we distill generalities and confirm previous impressions, adding a few new details where possible to improve our predictive accuracy. We can recognize a dog from having seen many different dogs. We can explain a food chain using any algae-eating fish, because we understand the basic framework of the concept--thanks to many examples in our head. A series of examples is necessary to build an understanding of a concept (Medin and Smith 1984, Kaplan and Kaplan 1982).

2. Mental models are made of landmarks and connections, or points and paths (Lynch 1960, Kaplan and Kaplan 1982). When building a map, we tend to use important or easily identifiable elements around which are clustered related elements. We carry a model in our heads about our solid waste stream, for example. Landmarks, such as our garbage can, garbage trucks, and landfills are connected with details about their efficiency, location, number, recyclables, cost, etc. Teachers can assist learners in building mental maps by pointing out what is important in the examples and how these elements connect. Having such a mental framework allows students to move, to test, to explore; they are less likely to be immobilized by helplessness.

Even having all the answers and understanding why they are important may not enable people to take action if they lack social support. We care about what other people are doing, and what they think of what we are doing. We are not keen to be too different, or different in an unacceptable way. Therefore, the cognitive map should be constructed in such a way that this social support is built in.

3. Since we need to know we are not alone, and that these new environmental behaviors are sanctioned by the leaders of our community (Rogers and Shoemaker 1971), the examples should highlight what people have done, especially normal people who take action and are respected rather than being considered eccentrics.

Consequently, we need to teach about the environmental problem, while at the same time empowering people with hopefulness by teaching about potential solutions. By analyzing a series of examples, organized to make clear the underlying structure and commonalities, students will begin to build their own cognitive map for solving environmental problems. Further, students are more likely to gain confidence in their ability to take some action if they also know that other ordinary people have successfully tackled these issues.

The Matrix

Over the last three years, my environmental studies classes have found the following exercise helpful for comparing examples and strategizing future actions. A matrix facilitates the comparison and discussion of examples.

Down the vertical axis of the matrix are four categories of environmental problem solvers -- those entities we think of as the parties who resolve environmental issues: individuals, environmental groups, government, and business/industry. Since these entities do not often take action on their own, but are prompted to action by other forces, the top of the matrix lists the same parties as motivators. In the 16 boxes are examples of actions taken by a motivator and targeted at a problem solver (see Table 1).

For example, when an individuals writes letters expressing their opinion to decision makers, they are acting in cell 3: "write letters." And if this action is prompted by a magazine article they read in an organization's magazine, they were affected by "provide information" in cell 5. Groups affect government agencies through lobbying, supporting policies, collecting data, building public opinion, speaking at a public hearing, and bringing lawsuit (cell 7). Governments affect groups through tax exempt status, contracts, grants, and regulations (cell 10). Filling in the matrix is a helpful introduction to this way of thinking about problem solving.

Using the Matrix

From an example of an environmental action, students distill the story into specific actions, mapping the strategy taken to produce that outcome. This exercise usually helps students realize that environmental problems are not solved by just one action or by just one party, but rather, that the solutions are a sequence of actions that snowball from one to another. Most environmental successes are amalgamations of much smaller actions; the very act of pulling apart a case makes evident these small but critical steps. As Karl Weick explains in his insightful essay, "Small Wins" (1984), since smaller problems are more easily solved, framing an environmental issue in pieces may provide an enormous psychological benefit. After an assignment to create a matrix on an issue of their choice, one student plainly stated, "Looking at the Action Matrix .... I am able to tell that all things are interconnected. Suddenly, the immensity of the problem is not so large after all."

Students may also discover some gaps in their matrix indicating actions that were not taken. Discussions of potential barriers and advantages to the actions they have identified help students think about what works, what does not, and why.

The categories or parties identified on the axes of the matrix also help students think about their role and expand it beyond merely an individual or member of a group. Since an ordinary person can also influence a government agency or a business, students can envision their actions reverberating across the matrix.

Student Comments

Examples of successes, analyzed within a framework that helps students identify actions that are effective, can be empowering. Enough relevant examples make it clear that people across this continent are actively engaged a host of projects dedicated to improving the environment.

Student comments collected over the years speak to this growing efficacy. Said one math major, "I no longer feel powerless in the face of combatting air pollution from cars. The battle still looks difficult, but not impossible. The chart also made me think of a number of other issues on which I could have a larger impact than I previously thought possible." A particularly quiet student wrote, "When constructed to fit the preceding matrix, it is apparent that there are many ways in which to tackle the problem of aerosol products."

Positive attitudes are more common after this assignment, and the connections between the Problem Solvers and the Motivators are easier to understand. One student was reminded of the power that citizens possess for influencing government and business/industry as voters and consumers. "Both of these roles allow the individual to vote in favor of whatever he/she supports. ... Each form is a powerful weapon and tool that is often overlooked or forgotten."

Summary

This simple matrix is a tool for analyzing environmental actions. By focusing on examples of efforts to resolve environmental issues, students can build a mental model of how environmental problems are solved. Their analysis of these concrete actions can help students approach environmental problems with an idea of what others have tried. Communicating what others have done may help build an acceptable new social norm for environmental action.

End Note

The reformulated helplessness model (Abramson et al. 1978) holds that how the individual attributes the source of the problem or success influences helplessness. Depressives tend to attribute bad events to internal (not other people), stable (not temporary) and global (not situational) causes (Peterson and Seligman 1987). Since our instruction of environmental issues tends to teach that these stable, global, plentiful and pervasive problems are caused by individuals, it is not a surprise that students find environmental problems depressing.

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Table 1: The Action Matrix

	Motivators			
Problem Solvers	Individuals	Groups	Government	Business
Individuals	Educate yourself Change lifestyle Letters to the newspaper Teach and talk to others Participate 1	Provide information Persuade Advertise Create educational materials 5	Regulate Tax Provide incentives Provide info Create educational materials 9	Provide jobs Advertise Make and limit options Create educational materials 13
Groups	Join Write letters Give money Elect leaders Become a leader Influence their agenda 2	Build coalitions Persuade Inform people Create networks 6	Research Lobby Regulate Give grants Tax status 10	Research Donations & Grants Provide jobs Endorsements 14
Government	Vote Write letters Run for office Raise funds Speak at public hearings 3	Research Monitor Lobby Bring lawsuits Endorse Speak at public hearings 7	Make appointments Give grants Charge fees Provide checks & balances Implement regs 11	Provide jobs File lawsuits Lobby Give money Advertise PACs 15
Business & Industry	Buy product Boycott product Write letters Buy stock Invest Report violations Draw media attention 4	Collect data Survey File lawsuit Lead boycott Create incentives Provide info Monitor 8	Create incentives File lawsuit Fine Regulate License Contract Zone 12	Compete with price Compete with quality File lawsuit Advertise Share technology Cooperate 16

ATTITUDES CONCERNING HUMAN ECOLOGY AND ENVIRONMENTAL EDUCATION

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A four-part human ecology research study was conducted in 1989 with professors, students, and professional environmentalists. Parts covered included: 1) finding solutions for the ecological problem, 2) willingness to change lifestyles, 3) the need for environmental education, and 4) sharing technology with lessor developed countries.

EDUCACION AMBIENTAL EN EL NIVEL DE EDUCACION PREESCOLAR EN MEXICO

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Abstract

This presentation will describe an analysis of the environmental contents in plans and programs. This analysis suggests that actual programs do not consider the ecological problem. There is an absence of an environmental education. Curricular/Didactic, Psychological and Ethical-psychological aspects of the problem will be discussed.

La Educacion pre-escolar en Mexico

Para hacer un diagnóstico sobre las características de la Educación Ambiental a nivel pre-escolar, resulta necesario como primer paso efectuar un análisis de los textos que son utilizados en este nivel.

En México existen cuatro libros para el nivel pre-escolar y cada uno de ellos remite a diversas instancias institucionales. El libro que mayor cobertura tiene es el de la Secretaría de Educación Pública (SEP). Su aplicación cubre fundamentalmente las áreas urbanas. Los textos restantes estan pensados para cubrir poblaciones especificas; el Programa Pedagógico de los Centros Educativos de Desarrollo Infantil (CEDI) es para hijos de madres trabajadoras; el Programa de Educación Preescolar en el medio rural lo publica el Consejo Nacional para el

Fomento Educativo (CONAFE) y está dirigido a los infantes que viven en el campo; finalmente el Plan y Programa de Educación Preescolar Indígena de la SEP, es el que, como su nombre lo indica, esta destinado a la población indígena.

En principio se puede pensar que la existencia de estos cuatro programas da cuenta de las diversas realidades del país. Sin embargo, por lo que a continuación expondremos se verá que en lo que respecta a la Educación Ambiental los hechos son otros. Existen algunas particularidades en relación a este nivel educativo que ayudan a entender la situación vigente. Podemos afirmar que el nivel de educación pre-escolar es el menos atendido en el Sistema Educativo Mexicano. En términos comparativos el presupuesto asignado a este nivel es notablemente inferior a los restantes. Por otra parte la educación pre-escolar no es obligatoria y su duración, que en la decada de los 70 era de dos años, se vio reducida en los 80 a un año. Estas disposiciones oficiales evidencian la poca importancia que se le otorga a la educación preescolar. Esta situación resulta contradictoria con lo sostenido a nivel discursivo por las propias autoridades,ya que en diferentes espacios resaltan la necesidad de elevar la calidad de la educacion a este nivel. También los hechos resultan contradictorios con lo que la mayoría de las disciplinas que estudian al niño sostienen teoricamente. En efecto, tanto desde la Medicina, el Psicoanálisis, Piaget, el cognocitivismo, en general se afirma que los primeros años de vida son capitales tanto para la estructuracion del psiquismo como para el buen desarrollo neurológico. Cae por su propio peso entonces la importancia que reviste la educación a este nivel. Estamos hablando de los momentos en que se constituyen los cimientos de la personalidad y de la capacidad de aprendizaje. Cualquier propuesta educativa que pretenda el desarrollo de actitudes frente a la sociedad y la vida no puede desconocer este hecho. Es por esta razón que nos parece preocupante el poco interés que en los hechos demuestra el sector oficial por este nivel.

Como hemos mencionado, de los cuatro programas existentes, el de la SEP es el de mayor cobertura. Este programa esta diseñado a partir de las aportaciones de Jean Piaget. No es este el espacio para analizar dichas aportaciones asi como sus limitaciones. Lo que retomaremos es solamente un aspecto que nos parece determina los alcances de su utilización en una propuesta educativa que tenga como uno de sus ejes centrales la educación ambiental.

Piaget plantea que la Psicología es una rama de la Biología. De esta manera, la lógica teórica que explica las fases por las que va pasando el niño, si bien reconoce la incidencia de lo social, expresado esto en la interacción, dará una primacía capital a lo genético. Es decir, en el desarrollo cognitivo lo cultural-social tiene un papel secundario. Nosotros no estamos de acuerdo con tal concepción. Habría que ir matizando ciertos postulados e ir investigando las mediaciones que lo social produce en el desarrollo cognitivo. Inclusive, es necesario estudiar el papel de lo "afectivo-subjetivo" en el desarrollo y pasaje de las fases propuestas por Piaget. Mas que negar la teoría del autor ginebrino, pensamos que hay que llevar a cabo un trabajo en donde se den las articulaciones posibles con aquellos aspectos que quedan relegados en sus trabajos: lo social y lo subjetivo.

Al analizar los libros de la SEP, se aprecia entonces como una de las características centrales que precisamente lo social, lo ambiental, lo cultural son tratados de manera esporádica y siempre subordinados a ejercicios que tienen como objetivo el desarrollo cognitivo. Esta situación se evidencia de forma ilustrativa en la manera en que son tratados los temas de las Unidades que conforman el programa. En efecto, en temas como "La vivienda", "La salud", "El vestido" etc., la preocupación esta centrada en ejercicios que permitan seriar, clasificar, pesar, medir, y en ningún momento se aborda lo que es la relación real del niño con el ambiente,con su ambiente. Se podría contra-argumentar que el niño no tiene todavía la capacidad cognitiva para entender la complejidad de la realidad. Esto es cierto si comparamos cognitivamente al niño con el adolescente, pero no lo es si entendemos que el niño padece su ambiente y por lo tanto intenta relacionarse con él. En esta relación, lo que esta en juego son significaciones sociales, valores, afectos, códigos culturales. Es decir, el niño construirá una interpretación de lo que pasa a su alrededor y de la forma como ese entorno incide en él. Esta interpretación se inscribirá psíquicamente y entrará en un proceso de metabolizaciones en diversos momentos de la vida. Lo anterior significa que esas vivencias inciden directamente en la estructuración del psiquismo. Este aspecto es de capital importancia porque precisamente muchos de los productos de esas metabolizaciones formaran parte del codigo ético-moral que regirá intra-psiquicamente la conducta del sujeto, es decir, la forma como se vinculará con su ambiente. Desconocer esta situación en "aras" de una concepción de desarrollo cognitivo que relegue el papel de lo social es negar la posibilidad de una educación ambiental en la que el sujeto este implicado en su realidad.

Como ya se mencionó, el programa esta estructurado por unidades. Esta, nos parece, es otra limitante, porque entonces la educación ambiental es tratada en algunos puntos de algunas unidades. Asi, el acercamiento multidisciplinario a la problemática ambiental, que en un primer nivel si se puede hacer con los niños, no se ve posibilitada por la estructura del programa. Si a lo anterior se le añade que en las escasas referencias que se hace a la Naturaleza esta es expuesta como una fuente inagotable de recursos y /o como recurso de ornato, se concluye que en el actual programa de pre-escolar es prácticamente inexistente una educación ambiental. La preocupación "obsesiva" por el desarrollo cognitivo, un programa armado por unidades y una concepción caricaturizada de la Naturaleza serían las caracteristicas centrales que lo hacen incompatible con una concepción de educación ambiental como formación de actitudes.

En relación a los otros programas, el único que amerita comentarios es el de CONAFE. La razón de ello es que el de los CEDI es practicamente una copia del oficial de la SEP, y el dirigido a la población indígena muestra un atraso pedagógico- curricular de muchos años. Por lo anterior y por la poca cobertura que tienen y las limitaciones de espacio del presente trabajo no los abordaremos.

El programa de CONAFE es sin duda alguna, desde una perspectiva ambiental el mas logrado de todos. La característica mas notable es que en función de que se aplica en comunidades con menos de 1500 habitantes, es decir, poblaciones rurales, el interes central es la integración del niño a su comunidad. Esta integración se trabaja fundamentalmente a través del conocimiento de su ambiente. La actitud hacia la Naturaleza es conservacionista mas que consumista y esto se refleja en la forma como estan pensadas las actividades pedagógicas. Lamentablemente es de suponer que debido a la no obligatoriedad de cursar el nivel preescolar y las condiciones económicas en que viven las zonas rurales de nuestro pais, la incidencia de este programa es mínima.

Tomando en cuenta las caracteristicas mencionadas sobre el nivel pre-escolar se propone, teniendo como perspectiva una Educación Ambiental integradora, superadora de dicotomias y creadora de actitudes alternativas frente al deterioro del ambiente natural-social, lo siguiente:

1. Que se constituya un solo modelo psico-pedagógico que oriente los diversos programas, los cuales serán acordes con las condiciones geográficas y socio-culturales de donde se apliquen.

2. Dicho modelo debe contener todos las aspectos de constitución del psiquismo infantil asi como el papel que juega lo social en ello.

3. La edad de los niños que cursan pre-escolar coincide con la instauración en el psiquismo de la instancia intra-psiquica que regirá moral y eticamente su conducta. Tal y como lo ha demostrado la teoría psicoanálitica este hecho es de capital importancia y debe ser tenido en cuenta en toda propuesta educativa.

4. La educación ambiental debe ser entendida como un conjunto de actitudes y valores frente al medio y no como simples contenidos de aprendizaje.

5. La educación ambiental debe llevar a un trabajo fuera del aula. Esta es una manera idónea de implicar al niño en su ambiente.

6. El psicoanálisis y Piaget han demostrado como el cuerpo opera como modelo de funcionamiento para el niño a esta edad. Por lo anterior, es importante incluir en las actividades diseñadas el papel del ambiente en el cuerpo; como es afectado por la contaminación, como es un eslabón en varias cadenas. Este hecho es fundamental para una educación ambiental ya que entonces, pasa por el propio cuerpo el reconocimiento de lo ambiental, lográndose así una integración y reconocimiento altamente gratificante.

SUPERSTITION: SERIOUS BLOCKADES IN THE UNDERSTANDING OF WILDLIFE CONSERVATION

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Superstitions can be very harmful to the survival of wildlife. Superstitions can lead people to exterminate various wildlife species because it is believed that these animals are harmful. Investigations into the nature of these superstitions are urgently needed. EE needs to work to eliminate them.

EDUCACION AMBIENTAL
EN EL NIVEL DE
EDUCACION MEDIA BASICA
EN MEXICO

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Abstract

This presentation describes the analysis of the environmental contents in plans, programs and text books. The analysis examines the actual conceptual and methodological approaches to science, the environmental dimension, the relations between man-nature, etc. Curricular/Didactic, Psychological and Ethical-Psychological issues concerning EE will be discussed.

La Educacion Ambiental se encuentra hoy en dia en un momento de transición entre una concepción tecnologica y una integral. Esta ultima incluye el avance tecnológico en la determinación histórico-social-cultural que lo caracteriza. Descontextuar el desarrollo tecnológico de sus determinantes acarrea grandes riesgos. Uno de ellos consiste precisamente en asumir una concepción de Educación Ambiental sesgada y por lo tanto parcializada. En el terreno educativo esta caracteristica se traduce en una formación distorsionada respecto a la realidad, lo cual evidentemente introduce un obstáculo importante en la consecusión de los objetivos establecidos.

La concepción integral de la educación ambiental ha permitido analizar la problemática concreta de cada país. Sin embargo, en los países del llamado tercer mundo la instrumentalización de las posibles soluciones no está exenta de problemas. Entre la falta de presupuesto y la tibieza de la voluntad política se dan muchas mediaciones que complejizan la situación. Una de estas mediaciones, la práctica educativa, es el objeto de nuestro trabajo.

En efecto, uno de los aspectos a considerar por su importancia en la prevención ambiental y conservación del medio, es la formación de agentes sociales cuya conciencia sobre la problemática ambiental los lleve a actuar tanto en lo inmediato como a largo plazo. Esta formación no puede estar centrada en los individuos porque el deterioro ambiental requiere de una conciencia y acciones colectivas. La magnitud del problema rebasa la "buena voluntad" de los individuos y obliga a la búsqueda de alternativas sociales de acción. En esta perspectiva se llevó a[1] cabo una investigación sobre el nivel de Educación Media Básica (secundaria), con la finalidad de hacer un diagnóstico sobre los contenidos de educación ambiental presentes en los libros de texto y los programas de estudio vigentes en México. Todo ello en la perspectiva de plantear líneas alternativas de trabajo y hacer propuestas al respecto.

El panorama que ofrecen los libros de texto a nivel secundaria es confuso; existe una diversidad tal de textos y autores que es imposible, a groso modo, establecer una caracterización pertinente del nivel. Ante esta situación y como resultado de la reflexión sobre este problema, se construyó la hipótesis de que esta situación era en realidad el reflejo y el efecto del "discurso" institucional mexicano. En otras palabras, lo que evidenciaba esta situación era la confusión y la tibieza de la voluntad política oficial para abordar el problema. A partir de lo anterior, la selección de textos para el análisis se hizo en función, por un lado, de la lista de libros de texto autorizada por la Secretaría de Educación Pública (SEP) y, por otra, en función de los libros mas vendidos y usados en el mercado. Las conclusiones las hemos organizado en función de cuatro rubros que consideramos centrales para todo análisis y propuestas sobre una educación ambiental.

1. Concepción de conocimiento. Implicaciones didácticas.

La primera característica que sobresale es la imagen que se ofrece del conocimiento como un producto ahistórico. Es rara la ocasión en que se hace la mas mínima alusión a las condiciones socio-históricas de producción del conocimiento. Este siempre aparece como el producto de un "genio", de una casualidad o como la consecuencia natural de la aplicación del método científico a la Naturaleza. De esta manera, es entendible la presencia de otra característica que para nuestra óptica es negativa; el conocimiento es ofrecido de manera enciclopédica. Es un conjunto de resultados, hechos, leyes, paradigmas, etc. que son presentados como tope, punto final del desarrollo de un proceso frente al cual solo se le pide al alumno que lo memorice. Al considerar el conocimiento como algo acabado, hecho de antemano, se condena al sujeto-alumno a tomar una pequeña parte del conocimiento y a considerarla como algo absoluto. El conocimiento es así inamovible y vinculado a valores absolutos y ahistóricos. Esta concepción resulta contradictoria con la que proponemos para una Educación Ambiental ya que esta problemática no puede ser abordada desde un enfoque fragmentario e individualista. Su complejidad obliga, como ya dijimos, a asumir una óptica interdisplinaria y de conciencia colectiva. Por esta razón pensamos que es también erróneo que los contenidos estén estructurados desde una lógica disciplinaria. Las posibilidades de interrelación se ven reducidas por la misma estructura de los currícula vigentes.

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[1] Cfr. Diagnostico y Analisis de Contenidos en la educacion Media Basica Jiménez S. M. del Pilar. Coord. CESU/UNAM. México, 1987

2. Relación Hombre-Naturaleza

Esta relación es vista principalmente desde una perspectiva utilitarista. La Naturaleza es un inventario de productos potenciales y un espacio donde el hombre reafirma su antropocentrismo, su poder, su imaginación. La Naturaleza subordinada es así contemplada como una fuente inagotable de recursos, que siempre ha estado, está y estará ahí, para que el Hombre satisfaga sus requerimientos.

3. Problemática Ambiental

Conforme a los señalamientos que hemos venido exponiendo, es dable esperar que la problemática ambiental sea abordada de forma parcial y descontextuada. En efecto, su tratamiento refleja la concepción educativa y de conocimiento que hemos criticado. Así en ninguno de los puntos tratados se considera ni la génesis ni los elementos estructurales: sociales, económicos, políticos, etc., del país. Al alumno se le proporciona en los textos una información de tipo descriptivo. No hay enfoque analítico ni problematizador sobre el problema. De esta manera,la acción depredadora del hombre así como de sectores sociales queda encubierta en una idealización del desarrollo técnico y de las ventajas que este ha traído. Y es precisamente en función de esta idealización de la técnica, que en la mayoría de los textos cuando se trata el problema del deterioro ambiental se ve al desarrollo técnico como la salvación. De esta manera, el uso "científico" de la técnica sirve para efectuar un desplazamiento del problema. En lugar de investigar las razones del problema para actuar de forma acorde, se idealiza una de las soluciones posibles y se dirigen hacia ella las comentarios. Esta situación produce un efecto paradójico en el alumno. En efecto, en la medida en que la alternativa tecnológica implica un alto grado de especialización, el alumno no logra sentirse parte actuante. Por el contrario, en tanto que su experiencia y la realidad material en la que vive le marcan el límite de lo posible en términos económicos, su actitud frente al ideal técnico será de un total extrañamiento. Su posibilidad de acceso a los medios técnicos son mínimos.

De ahí entonces que la información sobre la problemática ambiental y su solución la convierta en un material memorizable para cumplir los requisitos curriculares.

4. Aspectos psicológicos

La edad de los estudiantes que cursan la Educación Media Básica es compatible dentro de ciertos parámetros con la adolescencia. Esta situación le imprime al alumno una forma peculiar de vivir la escuela y la sociedad. Situación que llamativamente no es trabajada en ningún momento en los contenidos. Apoyándonos en la teoría psicoanalítica, entendemos que a esa edad se vive un conflicto identificatorio importante, que se traduce en un primer momento en una vivencia de "vacío" identificatorio, y en un segundo momento en un intento de resolver esta situación, lo cual explica la tendencia a la grupalidad en unos, o bien a la soledad en otros, con una connotación mística.

No es este el espacio para detenernos en consideraciones teóricas del psicoanálisis. Lo que queremos señalar a partir de las características que brevemente hemos subrayado, es que las condiciones psíquicas del adolescente son sumamente favorables para una educación ambiental integradora y activa. En efecto, debido al vacío identificatorio que puede llevar o bien a la grupalidad o bien al aislamiento mesiánico, el alumno puede asumir una actitud de compromiso colectivo frente a la problemática ambiental, lo cual a su vez estaría reforzado por la actitud mesiánica siempre y cuando el docente esté capacitado para canalizarla en el grupo.

Existen otras dos características psicológicas que son importantes para nuestra propuesta. La primera está vinculada con la anterior en tanto que la crisis identificatoria, aunada a los cambios fisio-anatómicos y psicológicos propios de la adolescencia, lleva a una preocupación continua del joven por su cuerpo, por los cambios que esta viviendo y que, a pesar de todas las cosas que se le enseñen, no termina de entenderlo. Otra forma de implicar al alumno en la problemática, será entonces enseñandole como su propio cuerpo forma parte de los procesos ecológicos; como es un eslabón de varias cadenas y lo que afecte a otros eslabones, por consecuencia, lo afectará a él también; como su cuerpo padece las consecuencias del deterioro ambiental y esto muchas veces sin que se percate de ello. Si bien es evidente que estos argumentos son utilizables en otros niveles educativos, pensamos que en la adolescencia adquieren un estatuto particular por los aspectos psicológicos ya mencionados. La segunda de las características psicológicas mencionadas, se refiere al nivel de desarrollo cognitivo alcanzado, según la óptica de J.Piaget. Es importante subrayar este punto, porque conforme a lo señalado por este autor, el nivel cognitivo alcanzado por el adolescente, es decir el período operatorio-formal, permite que la complejidad de la problemática ambiental sea abordada prácticamente en casi todas sus características.

Resumiendo, podemos decir que a partir de las características encontradas en los libros de texto y que ya hemos criticado, proponemos para este nivel educativo lo siguiente:

1. Una concepción de Educación en donde lo ambiental sea una óptica, una actitud formativa a lo largo del currículum y no una materia mas para aprender. Formación ética.

2. Que la concepción de conocimiento implique un proceso permanente de construcción y no actos acabados, absolutos y ahistóricos.

3. Que se asuma realmente la interdisciplinariedad como concepción de trabajo teórico y metodológico. La problemática ambiental no puede ser abordada de otra manera.

4. Que se contextúe en sus determinaciones socio-históricas la problemática ambiental.

5. Que a partir de las características psicológicas del adolescente se construya una concepción del proceso enseñanza-aprendizaje donde el trabajo grupal, la identificación con el problema y el cuerpo sean ejes centrales.

THE EFFECTS OF STS ISSUE INSTRUCTION ON CHARACTERISTICS ASSOCIATED WITH THE ENVIRONMENTAL BEHAVIOR OF MIDDLE SCHOOL STUDENTS

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This presentation will present research concerning the instructional effects of STS Issue Instruction, a methodology that integrates information processing, scientific problem-solving (inquiry), and responsible social decision-making. Data will be presented indicating that STS Issue Instruction significantly enhances a number of factors, e.g., ownership and empowerment, related to the responsible environmental behavior of middle school students.

RESEARCH AS A BASIC COMPONENT FOR ENVIRONMENTAL EDUCATION

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Abstract

Environmental education projects have as objectives the increasing of society's awareness of environmental issues and of the need for everyone's participation.

These actions are part of formal and informal communication processes. The message content of the media and other aspects of'communication that will allow a higher acceptance will be raised. Research applications to improve communication will be discussed.

LA INVESTIGACION COMO COMPONENTE BASICO PARA LAS ACCIONES DE EDUCACION AMBIENTAL

Durante muchos años nuestros proyectos de Educación Ambiental fueron conducidos y orientados solamente en la forma de enseñanza didáctica.

Todos los proyectos eran elaborados con una fórmula básica de enseñanza que se limitaba a un técnico del área especifica (biólogo en la mayoria de los casos) repasar. informaciones, enmendas a diversos segmentos de la comunidad através de palestras, carteles "slides," etc...

Todo este trabajo en la mayoria de las veces, no tenia continuidad, pues no existia motivación para tal.
El mensaje transmitido, la integración del hombre al medio, el descubrimiento real del valor no existia, alcanzaba solamente objetivos momentáneos.

Después de constatar esta realidad decidimos revisar la metodologia y las definiciones propias de Educación Ambiental. Entendimos que las acciones y proyectos de Educación Ambiental deberian ser conducidos a través de un proceso dinámico de comunicación utilizando sus métodos principales y recursos, así conseguiriamos una mayor receptividad del mensaje que deseabamos transmitir. Un número mayor de personas serian alcanzadas; utilizando los recursos disponibles de comunicación y sus motivaciones.

La integración hombre-medio-ambiente como el objetivo mayor de la Educación Ambiental exigia un estudio amplio, no limitado solamente a los conocimientos adquiridos en el área ambiental. Incluye ademas toda la complejidad de conocimientos que envuelve al hombre, su comportamiento y sus deseos; los motivos de la distancia del hombre con relación al medio y la falta de la valorización que existe.

La investigación surge en este contexto como un recurso de la comunicación y una necesidad para encontrar maneras claras de actuar. No se define la manera y el método de trabajar con determinado público sin antes procurar conocerlo.

No se debe utilizar un mensaje educativo sin analizar el grado de enseñanza y entendimento de un determinado público.

No se usa un medio de comunicación sin antes conocer el canal de mayor frecuencia y eficacia.

La investigación permite establecer un método, el mensaje adecuado y el canal correcto para conducir el proyecto. Ella se preocupa de las ansias, deseos e intereses en el sentido de dirigir nuestros objetivos de Educación Ambiental al público con quien trabajaremos. Ella permite conocer todos los elementos fundamentales envueltos en el proceso de comunicación.

Permite identificar al público que se quiere alcanzar, sus necesidades y comportamientos, fijando de ahi maneras que los motivaran. Prueba la eficacia de los canales utilizados para llevar el mensaje y así averiguar el grado de penetración que este tuvo en el público.

Los costos de produccion de "folders," adhesivos, carteles y transmisión de spots son altísimos. Por lo tanto numerosos trabajos y materiales educativos fueron producidos solamente considerando aspectos ambientales técnicos y visuales de nuestro interés, con recopilación muchas veces de información que fueron leídas, pero en la mayoriá de las veces incomprendidas.

Conviene resaltar que los resultados de la investigación dependen de la habilidad con que ésta es proyectada e implementada.

Algunos puntos deben ser considerados:

- Formular el problema y definir el objetivo: Estos aspectos deben ser bien claros para que las fases siguientes sean alcanzadas correctamente.

- Proyecto de investigación: Deberán estar definidas las fuentes de información, contar con formularios para anotar los datos, trabajo de campo y personal.

- Análisis de los datos y relaciones: En el análisis de los datos se debe usar métodos estadísticos como también analíticos.

La relación presenta los descubrimientos y recomendaciones principales del estudio.

Conviene destacar el uso del cuestionario como un recurso excelente para recoger datos. El permite elaborar una sucesión de preguntas que permitiran obtener un número mayor de datos.

Puede ser aplicado individualmente o en grupo, oral o escrito, por teléfono, etc... Sus ventajas principales son: versatilidad, rapidez y menor costo. Es importante que el cuestionario sea testeado primero; para percebir si es fácilmente comprendido y si las preguntas están hechas correctamente, generalmente se encuentran muchos errores en la formulación de un cuestionario.

Estamos haciendo investigaciones en nuestros proyectos y los resultados nos permiten una aproximación mas cercana a nuestro objetivo.

Un ejemplo fue la necesidad de hacer un trabajo con profesores que llevaron a sus alumnos a visitar una reserva ecológica. Sentimos la necesidad de aproximación con los profesores, para que nuestro trabajo en la reserva con los niños continuase en la escuela. Entonces elaboramos dos cuestionarios, uno para los profesores y otro para los alumnos. El resultado permitió la producción de material didáctico; manual y carteles para los profesores que hoy los repasan através de un curso, siendo su aceptación excelente, pues es fruto de las ansias no solo de profesores sino también de los alumnos.

La investigación bien elaborada y conducida correctamente es, sin duda alguna un componente importante en los proyectos de Educacion Ambiental.

Y, en la confrontación entre la resistencia del hombre a concientizarse y la aceptación de nuestras acciones de Educación Ambiental, la investigación actúa como un indicador.

EDUCACION AMBIENTAL EN LA CIUDAD DE MEXICO

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Abstract

A Research on the vegetation, fauna and socieconomic status was conducted on the eastern region of metropolitan Mexico City with the idea of using this data to develop an environmental education program.

Introduccion

La Educación Ambiental en la Ciudad de México, se organiza, por lo general, siguiendo un esquema tradicional en el que un grupo de expertos se reunen, dan un vistazo superficial a una zona, acuden a la revisión bibliográfica y se implementa una visita guiada al lugar seleccionado y lleva por ejemplo a un grupo de niños escolares y les muestra una serie de cosas durante el recorrido, dentro de la llamada interpretación ambiental se busca ser mas cuidadoso y mas rigido en el recorrido y que al interés científico que probablemente exista en el grupo, unir un aspecto estético o sentimental en torno al sitio a visitar, y asi se viene pensando elaborar el turismo ecológico.

En el presente trabajo se parte de una concepción distinta, esto es, estudiar primero a la población, detectar que necesidades tiene, que conocimientos posee, que es lo que le interesa, que debemos promover en ellos, con que recursos económicos cuenta y que tanto podria cooperar. Con esta base se proyectan las acciones a seguir.

Metodologia

Entre 1986 y 1990, se han aplicado encuestas a estudiantes de primaria y secundaria del sector Oriente de la Ciudad de México, mostrando sus caracteristicas socio-económicas, sus intereses en el ambiente, el medio que los rodea y que tanto saben sobre cuestiones ecológicas, tomando en cuenta ademas algunos indicadores de salud y de tipo psicológico, basados en métodos de la ecología urbana y de la psicología ambiental. Se ha trabajado en Ciudad Nezahualcóyotol, Estado de México y en la Delegacion Iztapalapa, D.F.

Resultados

Se ha encontrado que la población encuestada es sumamente pobre, con ingresos que apenas alcanzan 3 salarios mínimos, que la media familiar oscila entre los 8 y 9 miembros, que la superficie de cada casa se encuentra entre los 100 y 150 metros cuadrados, que el área destinada al jardin esta entre los 4 y 12 metros cuadrados, que el área verde esta entre 0.5 y 1 metro cuadrado por habitante (4 millones de seres humanos) incluyendo la superficie pública y la doméstica, que la diversidad de especies vegetales, tanto en las calles como en los domicilios es sumamente baja, la diversidad animal también lo es, que el grado de salud es bajo, que las visitas a parques, jardines, zoológicos, etc., no es muy frecuente y esta no tiene mayor relación con la presencia de los organismos en el interior de los hogares, que de cada 2 estudiantes, 1 tiene la noción de la ecología y de la educación ambiental, que mediante una exposición ornitológica se incrementa en 2 puntos su conocimiento sobre la avifauna y que las familias disponen de poco tiempo para las tareas ecológicas.

Discusion

No obstante todas las carencias señaladas y los problemas encontrados, existe entre la población el enorme deseo de mejorar sus condiciones ambientales y a pesar de contar con un suelo salino-sódico y escazes de agua, buscan incrementar la riqueza vegetal y animal de su casa y de su calle, haciendo un gran esfuerzo pero sin tener una adecuada orientación. Estudios similares se han hecho en Chalco y en San Cristobal Ecatepec, Edo. de México. Ademas se han diseñado juegos para los niños con mensajes ecologicos.

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TWO COMPLEMENTARY PERSPECTIVES IN ENVIRONMENTAL EDUCATION

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The analysis of environmental education literature and practice reveals that EE can be seen from two main perspectives: the environmental perspective and the education one. From each of these complementary perspectives, the problematic, the basic concepts, the object, the focus, the purpose, the target, the expected effects and the pedagogical approaches of environmental education are different. These differences will be clarified and examples will be discussed in light of various teaching models in EE.

WHY THE CLEAN AIR ACT MAY NOT SAVE TREES

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Recent revisions of the Clean Air Act aimed at reducing effects of acid precipitation have focused upon reduction of sulfur Dioxide and hydrocarbon emissions. Yet, nitrogen oxides (NO_x), which contribute in percentages equal to SO_2 as precursors of acid depostion, have been increasing historically, and reduction has not been legislatively mandated. A review of the supporting research evidence and hypotheses will be provided.

FROM BANYAN TO BUNYAN: CONCEPTS OF NATURE ACROSS TIME AND CULTURE

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Abstract

Concepts of "nature" differ greatly among and within cultures. What these concepts are, how they are formed, and their relation to environmental attitudes will be shown through: a) an analysis of Eastern and Western ideas; and b) findings of recent studies in the U.S. and India. Implications for cross-cultural environmental education will be discussed.

Merchant (1980, p. 4) said, "By examining changes in descriptions of nature, we can then perceive something of the changes in cultural values." Given that cultural values in turn influence the way we come to treat our environment, it should prove useful to examine various concept(s) of nature so that we can begin to understand on why environmental attitudes are as they are in different cultures, and how they came to be that way.

Two ways that concepts of nature can be addressed are informally and formally. The former means the common perception or understanding that people in general have in mind when they think about the natural world. The latter refers to the perception or understanding that comes about as a result of critical and intensive reflection on the question "What is nature?" These two ways of conceptualizing nature are exemplified on the one hand by those views which ordinary people hold, and on the other hand by those views formalized by philosophers or religious thinkers. Both, however are conditioned by cultural and environmental circumstances.

Our purpose in this paper is to 1) provide a short summary of some formal and informal "Western" and "Eastern" ideas that may have contributed to present day concepts of nature; 2) discuss the findings of recent studies in the

United States and India on the informal concepts of nature held by specific groups; and 3) discuss the implications for environmental education.

Western Concepts of Nature

Merchant (1980) has forcefully argued that exploitation of nature in the West has been a consequence of a conceptual shift that occurred during the Scientific Revolution. Specifically, this shift was from a holistic to an atomistic cosmology of the earth. Whereas premodern European societies viewed the earth as a female organism (quite literally as "Mother Earth"), modern European societies came to view the earth as nothing more than a nonliving machine made up of discrete parts. According to Merchant, this valuational shift had the effect of transforming constraints on certain activities affecting the earth into sanctions, contributing to our present environmental predicament.

This value transformation was apparently unhindered by philosophy. In fact, Hargrove (1989) states that philosophy is in some sense responsible for our present environmental problems, primarily because it has never taken seriously the idea that the environment represents a legitimate area of concern for philosophy.

In the United States, informal concepts of nature are influenced by various factors. A study of U.S. college students who were asked, "What does nature mean to you?" revealed that concepts of nature ranged from simple to complex, and were influenced, in part, by personal experiences of nature (McKnight 1990). At the most basic level, nature was commonly conceived of as discrete elements (e.g., trees, plants, birds and animals) or as that which is "not manmade." These simplistic ideas, as well as the idea that nature is aesthetically or psychologically pleasing, were apparently not enough for students to accept major constraints on human alteration of nature. Although appreciating "the view from the top of the mountain," these students felt that "some of [nature] has to be given up for the betterment of [people]."

A relatively small number of students conceived of nature as the sum of the interrelationships among various biotic and abiotic components. These students gave complex meanings of nature, often including emotional effects or aesthetic or sensory impressions as well as ideas about interrelationships and processes. Central to their concepts of nature were "balance" or "life." What was considered unnatural was not what humans make, but human interruptions or influences which upset the balance of nature and endanger life. "True, pure" nature was felt to be a thing of the past; in recent history humans have altered the natural balance. Nonetheless, further interference must be checked--not for human welfare alone, but for the other living things, for life itself--for nature. Most significant was the fact that students in this group had life-long experiences of nature, exploring nature as children and later engaging in nature-appreciative activities, often supplemented with environmental education. They were, in effect, natural historians_they enjoyed the unique opportunities for discovery and for seeing how nature functions, and the feelings of "connectedness" these activities afforded them.

Concepts of Nature in India

In India, where religion, not science, has historically played the leading role in the formation of societal attitudes, traditional concepts of nature have had an ambiguous effect on the development of positive environmental attitudes. On the one hand, religious concepts such as ahimsa (non-violence) have had positive, albeit unintended, environmental consequences (Lodrick 1985). On the other hand, the idea that nature is unreal or illusion (maya) has prevented the formation of a true environmental ethic (i.e., one that incorporates an ecological understanding of natural systems and the human-nature relationship). While this traditional balance of religious sanctions and constraints served India for many centuries, ongoing resource depletion and population growth would eventually have ended the usefulness of traditional concepts of nature even without foreign intervention.

As it turned out, the introduction of Western ideas (not to mention the effects of colonization on resources and population) made the decline of traditional ideas swifter and more complete. Specifically, the traditional concept of nature as unreal and thus unalterable by humans has been replaced by the Western scientific belief that nature is real and can be manipulated for good or bad. This idea is supported by the results of a recent study of middle school children in Ahmedabad (pop. ca. 5,000,000) which showed that certain Western images of nature had displaced more traditional views, particularly among children of upper-middle class families attending English-language private schools (Ettenger 1990). These students tended to answer the question "What is nature?" by mentioning its beauty, our dependence upon it, and the need to preserve it_responses similar to those of U.S. children (Rejeski 1982).

A second general category of attitudes was seen in the responses of children attending private schools that taught in the regional language (Gujarati). To these students, most of whom were from more traditional middle-class families, nature was a source of material wealth, often expressed as "unending" or "inexhaustible." Such a view reflects the concept of nature which held sway in the U.S. until quite recently, and which for many still does. A third class of responses was found among the most traditional group within the sample, those children attending government-run (free) schools. To these students from lower socioeconomic classes, nature still represented a blind and powerful force, or at best an endless and unfathomable gift from God. As in the U.S. study, many students in this group listed elements of nature (living or nonliving) and/or remarked that nature is "all the things that man cannot create."

Conclusions

The points we would like to emphasize are: 1) neither the traditional Indian metaphysical view of nature nor the Western atomistic concept of nature is conducive to environmentally sustainable behavior; 2) cross-cultural transfer of ideologies, in combination with rapidly changing social conditions, may be responsible for undermining unified cultural concepts of nature; and 3) our findings suggest that personal experience of nature is an important, but not sufficient, means of fostering positive environmental attitudes.

Individuals views of nature are influenced by experience, in part determined by the economic, social and environmental conditions under which they live. Although a predominant concept might be transmitted through various social institutions, individuals can develop alternate concepts based on personal experiences of nature, environmental education and other influences. As the world becomes increasingly urban and globally-oriented, the opportunity for intimate contact with nature may be diminished, but contact with alternate ideas will increase. Environmental education based on a holistic approach to learning which incorporates both the understanding of complex, culturally diverse ideas as well as direct and intimate contact with nature is essential. The combination of ideas and experience is needed to create an appreciation of natural systems, collectively known as nature, and an understanding of the role of human thought and behavior, collectively known as culture, within those systems.

In order to begin forming positive environmental attitudes, one assumption seems to be of particular importance: Our conception of nature can affect our values and consequently our overt behavior with respect to nature. Environmental educators can thus help engender positive environmental attitudes through stressing a more holistic concept of nature that emphasizes the interrelatedness of existence.

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NATIONAL SURVEY OF EE CENTER GOALS: ARE WE REALLY PRACTICING WHAT WE PREACH?

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Abstract

The goals of EE centers reflect their purposes and philosophies, guiding the development of programs and services. Through a nationwide survey of 1300 centers, this presentation provides a snapshot of the field as it is being defined and put into action. The results suggest, however, that we may not be practicing what we preach.

Introduction

The goals of nature and environmental education centers reflect their purposes and philosophies. By looking at the goals of centers nationwide, one obtains a snapshot of the field as it is being defined and put into action. The purpose of this paper is to describe the varied goals of centers throughout the U.S. and to examine the degree to which they are consistent with the goals of environmental education.

Throughout the development of environmental education, many have debated its goals (see Stapp, et al. 1969; Harvey, 1977; Childress, 1978; Hungerford, et al. 1980; Dissinger, 1983; Volk, 1984). These goal statements all suggest that encouraging environmentally sound behavior is a desired outcome of environmental education. Furthermore, these statements establish a process, a behavior change model, through which knowledge, attitudes, skills, and psychological factors (e.g. commitment) play integral roles in encouraging environmentally sound behaviors. To this point, UNESCO (1987), in defining environmental education, suggests a model of action "in which individuals and the community gain awareness of their environment and acquire the knowledge, values, skills, experiences and also the determination which will enable them to act-individually and collectively-to solve present and future environmental problems." Drawing from these goals it is possible to suggest a behavior change model summarized as a linkage between knowledge (issue level knowledge as well as knowledge of natural systems), attitudes, problem-solving skills, psychological factors (especially the development of self-esteem) and environmentally responsible behavior.

Data Collection

Data was gathered from 1225 nature and environmental centers throughout the United States. The centers filled out a detailed questionnaire as part of the development of the Directory of Nature and Environmental Education Centers, (NSYF, 1990). The questionnaire contained items concerning the center's mission and goals, program, audience, management, and facilities. Those filling out the directory questionnaire were provided with a list of goal statements and were asked to rate each item as to whether it was a major goal, a minor goal, or not a goal of their center.

Results

Program Goals

As can be seen in Table 1, nature study is the most often (76.1%) mentioned goal. Significantly more centers indicate nature study than any other goal. The second most often mentioned goal is encouraging environmentally sound behavior (74.4%), followed by teaching local natural history (71.5%), and influencing people's attitudes (66%). The remaining five goal statements were each mentioned by less than half of the centers as either major or minor goals. It is interesting to note that so few of the centers consider these to be primary goals. Less than 15% endorse disseminating local environmental issues information or helping people develop self-esteem as major goals; only 6.7% indicated that environmental activism is a major goal.

Developing a Model of Behavior Change

The goal statements show both the diversity of philosophies held by centers as well as the underlying similarities. These statements taken alone are of interest, but it is the degree to which they reflect the implicit models held by centers of how change comes about and the role that centers see themselves playing in bringing about change that is particularly enlightening. In the following analysis, the goal statements will be examined in combination with one another to determine which factors are most often incorporated into the working model of behavior change adopted by the centers (Table 2).

The Role of Nature Study

At the root of the programs surveyed is a belief in the importance of studying nature. For some, nature study is a goal in of itself, with the end being greater knowledge of the natural world. For nearly ten percent of the centers, nature study or teaching about local natural history were the only goals indicated.

But although nature study forms a common thread for most centers, other goals may be combined with it to create a model for change. Sixty-four percent indicated that both nature study and encouraging environmentally sound behaviors were goals of their center (Table 2). Often, nature study is seen as a way that the interconnectedness of life can be shown and therefore the link to the need for responsible behaviors can be made.

The Role of Attitude Change

Connecting nature study with motivating people to responsible environmental behavior reflects a simple model of change, one that assumes there is a direct connection between knowledge acquisition (nature study) and appropriate behavior.

For some, attitudes and attitude change are seen as essential to the role played by nature and environmental education centers. Thus, influencing people's attitudes can be combined with nature study to form an expanded working model. Approximately half of those surveyed (52%) indicated that nature study, influencing people's attitudes, and encouraging environmentally sound behaviors were all goals of their programs (Table 2).

The issue of explicitly trying to change attitudes is, however, not embraced wholeheartedly. Significantly fewer centers list influencing people's attitudes as a goal than list nature study, encouraging environmentally sound behavior, or teaching local natural history (Table 1).

The Role of Local Environmental Issue Information

Disseminating information on local environmental issues was considered a goal by 43.5%, with only 13.6% considering it a primary goal (Table 1). Although the change model speaks of the need for people to have issue specific information in order to act, only 36.9% of the centers combine disseminating local environmental issues information with nature study as a means to encourage environmentally sound behavior (Table 2).

It is interesting to note the while there is a strong endorsement of nature study (76.1%) as a method of providing a knowledge base, significantly fewer consider disseminating information about local environmental issues (43.5%) as an appropriate method of increasing knowledge.

There seems to be a resistance to delving into areas that may have political overtones. The centers appear to be trying to avoid controversy, choosing to define their educational roles narrowly and safely.

The Role of Environmental Problem-solving Skills

Hines (1984) states that "an individual's ability to act is dependent not only upon possessing knowledge of how to act, but also upon an individual's skill in applying that knowledge to the problem. The erroneous assumption is often made that skills evolve naturally from knowledge." Given the importance placed on skill development, it is disappointing that only 40.6% (Table 1) include developing environmental problem-solving skills as a goal. Even more disappointing, however, only 36.1% see environmental problem-solving skills as being a part of the working behavior model of encouraging environmentally sound behaviors (Table 2).

The Role of Developing Self-esteem

Likewise, few centers focus on helping people develop self-esteem (31.6%). And when self-esteem is included in the change model, only 27.4% (Table 2) of the centers indicate that it, nature study and encouraging environmentally sound behaviors are goals. Although self-esteem may only represent one of a number of psychological factors related to environmental behavior (i.e. locus of control, commitment, efficacy), its low level of endorsement suggests that centers are not emphasizing these precursors to environmental behavior in their programs.

The Role of Environmental Activism

Finally, the uneasiness of dealing with attitudes is only intensified when one asks if environmental activism is a goal. Less than one third of the centers considered this as a goal, only 6.7% as a primary goal (Table 1). It seems that environmental activism, with its implied political action, is considered beyond the scope of most centers, while encouraging environmental lifestyles is considered appropriate.

Discussion

At the very least, the results of the study illustrates the diversity of programs within the nature and environmental education centers surveyed. Some have defined their purpose in terms of nature study and teaching about local natural history, while others see their role as being a change agent, programming for environmental activism.

Perhaps of greater interest is the apparent inconsistency among the endorsement of various goals. The centers seem to be comfortable with the idea of actively encouraging environmental behavior. On the other hand, there is considerable resistance to supporting the goals of influencing people's attitudes, disseminating information about local environmental issues, or even helping people develop environmental problem-solving skills.

For the most part, centers are endorsing a simple change model that links nature study directly to environmental behavior. The question is, however, how can a center enable people to act in an environmentally responsible way without incorporating the other components of the change model into their programs? The results suggest that centers need to examine closely their stated goals and the programs inspired by them.

TABLE 1

Center Goals

Goal	Major Goal	Minor Goal Total	Combined
Nature Study	57.0	19.1	76.1
Encouraging environmentally sound behavior	50.3	24.1	74.4
Teaching local natural history	46.9	24.6	71.5
Influencing people's attitudes	41.9	24.1	66.0
Disseminating local environmental issues info	13.6	29.9	43.5
Developing environmental problem-solving skills	17.5	23.1	40.6
Developing self-esteem	14.9	16.7	31.6
Environmental activism	6.7	22.1	28.8

TABLE 2

Building a Model of Behavior Change

Model Components	Percent Endorsing
Nature study + Environmental behavior	64.4
Nature study + Influencing attitudes + Environmental behavior	48.9
Nature study + Local issue information + Environmental behavior	36.9
Nature study + Problem-solving skills + Environmental behavior	36.1
Nature study + Developing self-esteem + Environmental behavior	27.4

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THINKING GLOBALLY, ACTING LOCALLY: TAKING AWARENESS TO ACTION

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The state of the globe is sending up a BIG RED FLAG in all our minds that ACTION on behalf of the Earth by the world's citizens is critical. Much of the research addressing how environmental education can meet this challenge of bringing people to action will be presented along with strategies for incorporating action in environmental education programs.

THE EFFECT OF INFORMATION AND CONSUMPTION FEEDBACK ON THE DOMESTIC WATER USE IN A MEXICAN CITY

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Abstract

An intervention study was designed to prove the efficiency of two techniques (information and consumption feedback) in attempting to reduce domestic water use in a Mexican urban zone.

Four elementary school student groups were studied using an A-B-A design. Results show that neither information nor consumption feedback proved to exert influences on the water consumption behavior.

From here we could promote educational programs based on alternative strategies.

Limited water supply is one of the most important problems in Mexican cities today, especially in desert zones. Hermosillo, Sonora, which is in the northwestern area of Mexico, faces this problem, with accelerated population growth (5% annually).

In this community, studies have been developed standing out physics-technological aspects of the water supply, among these we find research on water sources, water quality, etc. (Sortillon et al, 1987). Muoz and Ritchie, 1987). In the field of the social disciplines, the research related to the water consumption is scarce and involves psychological science. Although a relationship between behavior and water consumption is evident, studies (descriptive or interventional) are scarce in Mexico as well as in the rest of the world.

Due to the above, in this paper we present the results of a study in which two behavioral procedures were used to probe their efficacy in promoting rational water consumption. Previous studies have shown that these strategies and others are not effective in promoting water conservation in other countries (Winkler, 1982; Hamilton, 1985). Our interest is to corroborate these results in a Mexican population.

Method

Subjects: A sample of 36 children, in 5th and 6th grades in elementary school. They belonged to families totalling 160 consumers, at a homogeneous socioeconomic level.

Materials: Used registration sheets for the lecture on the water measuring device, instructive pamphlets, conservation strategy, illustrated in sheet cards, pencils, pens, posters and watches.

Procedure: A multivariable ABA design with control group was used in which phase "a" consisted of base line: the picture of water consumption in the four groups. In phase "b" children were distributed in three different conditions: condition 1 (consumption feedback); condition 2 (information); condition 3 (feedback plus information); and a control group, which did not receive any treatment.

In condition 1 (feedback) children were trained in the lecture of the water measuring device. Besides subjects received training in register techniques. This register considered the number of visitors (nonresidents in the children house) that consumed water in a day or more. All the information obtained was placed in sight of the family. Verification of lectures were done to assure reliability.

In condition 2 (information) an informative package was used. This package included:

a) A verbal statement about: 1. definitions, 2. water states, 3. water importance, 4. water distribution, 5. sources of water supply in the city, 6. water assignment by habitat, 7. water waste, 8. alternatives for rational use of water; and

b) A pamphlet elaborated by the potable water state system (provider), which includes a summary of the above mentioned information;

c) Posters and stickers placed in selected spaces (wash stands, water closets, dishwashers, etc.) to instigate the rational use of water.

Condition 3 was a combination of conditions 1 and 2. Finally the control group didn't receive any experimental treatment.

In late phase (A), visits to children were suppressed, and the lecture on water consumption continued for two weeks. This lecture was carried out by the investigators.

Results

Data on the water consumption was processed using an Analysis of variance (ANOVA) a significance level of P 0.01 was required.

Feedback contribution group (condition 1) produced a group mean of 54,746.5 liters by week (LBW) in the base line situation; proceeding to 55,066 LBW in the experimental situation (phase B) and 62,784.5 LBW in the follow up phase.

Information condition group (condition 2) showed a mean of 61,797 LBW in base line, 57,157.2 LBW in phase B and 56,203 LBW in the late phase.

Information plus feedback condition group (condition 3) presented in base line a mean of 64,181 LBW; 60,983 LBW in phase B and 74,599 LBW in the follow up phase.

Finally the control group mean is 60,661.4 LBW a lang all the experiment period.

Experimental treatment in any group didn't exert significant influence as revealed ANOVA application.

Conclusion

Neither information nor consumption feedback seems to promote water saving in the studied sample. The results replicated and corroborated those obtained by Winkler (1982) in the U.S. sample. This reflects the low effectiveness of the techniques, at least in the studied subjects and under the conditions in which feedback was provided. Also the information structure is responsible for the results.

Results obtained demand the urgency of investigating new intervention strategies, also reject the present "saving" practices used by the state office responsible for water supply. It is that water conservation does not appear.

PRONATURA ENVIRONMENTAL EDUCATION ACTIVITIES IN CHIAPAS

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Chiapas is probably the second State in Mexico regarding biological diversity. PRONATURA has been very active with environmental education and with the establishment of the Huitepac Reserve.

SELECTING ENVIRONMENTAL SOFTWARE

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In 1988, National Commission on Environmental Education Research began a project to collect, appraise and distribute environmental software that reflects the goals of its parent organization, NAAEE. The commission has, at this point, developed an evaluation tool that can assist individuals in the selection of ecological and environmental software. The instrument and its use will be discussed.

EVALUATING ENVIRONMENTAL EDUCATION MATERIALS: WHAT'S GOOD?

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What makes material environmentally suitable? We have to know what kinds of questions to address to the material at hand. How to do this is the focus of a workshop for educators developed by Public Focus, an organization with a longstanding commitment to innovative environmental education programs for students in primary and secondary schools in Ontario.

INFORMATION SOURCES FOR TREE CARE: PRELIMINARY FINDINGS AND IMPLICATIONS FOR TARGETING NON-FORMAL ENVIRONMENTAL PROGRAMS

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Abstract

To educate a broad base of the public, educators must understand sources of information people use to learn about environmental issues. This study examined sources of information obtained on tree care. Respondents got information from several sources, although the frequency with which they obtained this information varied somewhat with different sources. Interpersonal or specialized information sources were not obtained with great frequency. Rather, people relied primarily on the media.

Lack of awareness of environmentally related behaviors has been identified as an important barrier to participation in those activities (Ellis and Rademacher, 1986; Godbey, 1985). Although there are many reasons people may be unaware, one possibility is that information is not reaching them. While family and friends are important information sources in many instances (Uysal, et al., 1990; Etzel and Wahlers, 1985; Gittleson and Crompton, 1983; Rosen, et al., 1989; Pedersen, 1989), these interpersonal networks may not be able to supply the rather specialized information that people need to be aware of environmentally responsible behaviors. One first step for assessing if information is reaching people is to determine the sources of information that are disseminated on environmentally related behaviors. This study investigated such sources with regard to urban homeowners' tree care.

Methods

To examine types of information sources people got on tree care, a mail questionnaire was developed as part of a study on urban forest and pest management problems in Michigan. Participants were asked about the frequency with which they got tree care information from various sources. These sources were: family, friends, newspaper, television/radio, Cooperative Extension Service (CES), and tree clinics.

Participants were randomly selected home owners from three urban centers in Michigan. Two of these urban areas have no major tree problems. The third area has extensive tree damage due to gypsy moth infestations, as well as a community-sponsored suppression program to reduce the impact of the gypsy moth on community trees. Approximately 22% of questionnaires were returned, with no difference by city (Young, 1989).

Results

Respondents were first classified according to how many information sources they received. As Table 1 shows, respondents got tree care information from multiple sources. Nearly two-thirds of the sample was getting four or more information sources at least seldom, and nearly 20% of respondents got four or more sources often or very frequently.

Moreover, those in the city with community-wide damage to trees were more likely to get information from three sources, whereas those with no community wide tree problems were most likely to get information from zero sources.

Although respondents got information from more than one source, some sources of information were more commonly received than others. The next section examines types of information that respondents got.

Interpersonal Information Sources

People share information and sometimes mis-information with those around them--friends, colleagues and family members to name just a few. In fact, friends and family often constitute a critical source of information (Uysal, et al., 1990; Gobster, 1990). Two interpersonal sources of information were included on this survey: frequency of getting information from family, and frequency of getting information from friends. Respondents did not seem to receive information as frequently from family and friends as might be suggested by studies in recreation and leisure (Etzel and Wahlers, 1985; Gittleson and Crompton, 1983; Pedersen, 1989), although friends were used somewhat more frequently than family members (Table 2). For both of these interpersonal sources, respondents were well distributed across all frequency levels.

Media Information Sources

The media has long been used as a tool to inform people about community events and other happenings that may be relevant to people's lives (Littlejohn, 1983). Respondents were asked about how often they got tree care information from two different types of media--newspapers, and radio/television. Newspapers were frequently obtained

(Table 2). In fact, the newspaper had the highest percentage of respondents indicating they got this source very frequently, and was nearly 10% higher than friends, the next highest percentage indicating "very frequently". On the other hand, respondents got information from television and radio relatively infrequently, with nearly one-third indicating they never got information on tree care from radio or television.

Specialized Information Sources

Numerous specialized information sources have been developed over time to meet people's needs for detailed information on particular topics. For instance, Birch and Pywell (1986) found that non-industrial private forest owners tended to use specialized magazines for information on forest management. Garden centers and nurseries were popular information sources for residents who use pesticides (Grieshop and Stiles, 1989). Two items on specialized information sources with regards to tree care were included on the survey: Cooperative Extension Service (CES) and tree clinics. CES, of course, is a nation-wide service that supplies information on widely varying topics, including farming, gardening and household services as well as tree care. Tree clinics, on the other hand, tend to be more localized, and may be held at citizens' requests, or result from city foresters' foresight in serving community needs.

In general, respondents did not get specialized information sources frequently (Table 2). For instance, nearly three-quarters of respondents indicated they never got tree clinic information, and 40% said they never got tree care information from CES. Also very few respondents indicated they got information from these sources "very frequently."

Discussion and Summary

Respondents appeared to get information from several sources, although the frequency with which they obtained this information varied across the type of information source. Interpersonal sources were not obtained with great frequency, nor were specialized information sources. Instead, people relied on media sources. This was particularly true for respondents in the community with extensive tree damage.

High frequency of interpersonal sources had been expected given previous research in recreation and travel. However, the results in this study are more similar to findings about information sources on hazardous materials

(Hammond, 1989). These respondents generally obtained information from media sources rather than interpersonal sources (Hammond, 1989). This suggests that respondents in this study may not view tree care as a household discussion topic, but rather as a more technical topic, where they might get information from what they perceive as authoritative sources. But respondents' lack of getting specialized information sources suggests this may this may not be so.

Unfortunately, respondents were not asked directly about getting information from city foresters, lawn and garden centers, or from brochures, exhibits, or other specialized educational materials. However, with the exception of brochures, no respondent indicated they used these sources in the "other" category. This further suggests that specialized types of sources are not reaching home owners.

The lack of getting specialized information is intriguing. Perhaps, respondents are not seeking out information from these sources. This seems somewhat unlikely however, given these respondents were heavily involved in yard care, with approximately two-thirds of respondents indicating they participated in yard care very frequently, and nearly 25% participating often, while only 1% indicated they never did their own yard care. A more likely situation may be that these specialized materials are not reaching their target audiences, and more effort may be needed to adequately disseminate them.
The rather low frequency of getting specialized information sources is also disturbing given these materials require extensive resources to produce. Tree clinics, for instance, are labor intensive in all phases from planning to implementation. Brochures are commonly produced by numerous urban forestry organizations, but were barely mentioned as an information source. Perhaps educational specialists and urban forest managers would be more effective if they focused their efforts on working with the media to make sure accurate, timely, and interesting information is included in this source rather than producing specialized materials. Yet they should also provide information through diverse sources as people generally tend to use several sources.

In short, although home owners got information from diverse sources, they did not get it very frequently. Educational specialists and resource managers may need to spent more effort to distribute this information if they hope to educate home owners about tree care.

TABLE 1. Percentage (n) of Respondents who got 0-6 Information Sources on Tree Care

# Sources	% Using Sources Seldom or More		%Using Sources Often, Very Frequently	
0	6.5	(36)	29.6%	(164)
1	6.1	(34)	16.1	(89)
2	8.5	(47)	18.8	(104)
3	15.5	(86)	18.6	(103)
4	23.3	(129)	11.2	(62)
5	22.0	(122)	[illegible] 8	(21)
6	18.1	(100)	2.0	(11)

% may not add to 100% due to rounding

TABLE 2. Percentages of Getting Different Information Sources About Tree Care (n)

	Frequency of Use			
Source	Never	Seldom	Often	Very Frequently
Interpersonal Sources				
Friends	14.9(100)	34.6(232)	33.3(223)	17.2(115)
Family	29.4(187)	31.1(198)	24.8(158)	14.6 (93)
Mass Media Sources				
Newspaper	13.4 (95)	28.6(203)	33.1(235)	24.9(177)
Television/Radio	32.4(208)	36.0(231)	20.7(133)	11.0 (70)
Specialized Sources				
Tree Clinics	69.2(415)	22.2(133)	4.0 (24)	4.7 (28)
Cooperative Ext	40.3(263)	32.9(215)	15.5(101)	11.3 (74)

*percentages may not add to 100% due to rounding

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THEORETICAL-PRACTICAL RELATIONSHIP OF ENVIRONMENTAL EDUCATION AMONG THE ETHNIC GROUPS OF MEXICO

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The epistemological problem of the articulation of sciences in approaching rural environmental education in Mexico must take into consideration the productive and intellectual practice of the ethnic groups. It is in this way, that we intend to concretize a methodological proposition of the environmental education in the Indian environment, tending to solve the great ecological and organizational damage in the Indian setting of Mexico.

STRAND II: Educating about Environmental Issues and Policies

LOS PARQUES NACIONALES Y RESERVAS COMO UN INSTRUMENTO PARA LA EDUCACION AMBIENTAL EN MEXICO

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Abstract

This presentation describes the development of environmental education at the University level which emphasizes performance of research in ecological areas by students from different careers. The goal of the program is to confront students with actual environmental problems and to relate these problems to their professional activities.

Se expone una experiencia docente con alumnos de los ultimos semestres de las carreras de Arquitectura de Paisaje y Urbanismo de la Facultad de Arquitectura de la UNAM, en el desarrollo de un tema sobre el análisis, propuestas de manejo y diseño de dos denominados Parques Nacionales, los cuales se encuentran ubicados en el Distrito Federal, México. Dichos parques no cubren los requerimientos minimos para ser catalogados como Parques Nacionales por la ONU, sin embargo, su ubicación, extensión y uso actual, hace necesario centrar nuestra atención en ellos. Los parques son "El Tepeyac" ubicado en la zona NE de la ciudad y el "Cerro de la Estrella", ubicado en la zona SE. El análisis y las propuestas fueron realizadas por los alumnos dentro de la materia de Ecologia Regional del 7o. semestre, bajo mi dirección.

Parque Nacional "El Tepeyac", es declarado asi el 27 de enero de 1937, por el presidente Gral. Lazaro Cardenas, debido a los trabajos de reforestación realizados en los cerros de el Tepeyac, Guerrero y Santa Isabel, pertenecientes a la serrania de Guadalupe al Norte de la ciudad, desde los cuales se observa la ciudad de México y la gran planicie del antiguo Lago de Texcoco, teniendo una superficie aproximada de 1500 hectáreas. El parque se localiza en la Delegación Gustavo A. Madero al Norte del Distrito Federal. Se encuentra rodeado por un uso del suelo predominantemente habitacional, a excepción de la zona Norte, que esta caracterizada como industrial. Los asentamientos irregulares se presentan en el perimetro oriente correspondiente a la colonia Gabriel Hernandez de la Delegación y en la falda Nor-poniente del cerro de Santa Isabel en el Municipio de Tlalnepantla, Estado de México. Este es uno de los problemas mas serios que existe actualmente en la zona, ya que las colonias cada día se expanden mas hacia los terrenos del parque, que hasta la fecha es de poco menos de 300 hectareas.

En relación al visitante, la actividad principal que se detectó fue el ejercicio al aire libre, días de campo y excursiones a las partes mas altas. Las encuestas realizadas dieron el siguiente resultado:

- El 63.8% visita el parque por sus áreas naturales, el 36.1% por su fácil acceso.
- El 65.5% lo visita una vez por semana.
- El 80% de la población entrevistada se enteró de la existencia del parque por parientes y amigos, el 20% por conocimiento directo.
- Al 68.9% les agrada el parque por los espacios para la práctica de deportes, al 30% restante por las áreas para día de campo.
- El 32% quisieran que existieran áreas acondicionadas como merenderos, el 24.5% áreas para realizar deportes y el 16% zonas para acampar y resguardos.

Actualmente el parque cuenta con las siguientes instalaciones:

- Una casa administración con dormitorio, cocina, baño, bodega y servicios de luz y agua, que se encuentran en buen estado.
- Una palapa con piso de cemento, sin paredes ni servicios que es utilizado generalmente para realizar comidas familiares y prácticas de karate.
- Una serie de juegos infantiles que se encuentran en pésimo estado, por falta de mantenimiento.
- Dos sanitarios para servicio al público, ubicados en el área de la administración, en mal estado.
- Nueve mesa-banco de concreto en mal estado, algunos cuentan con hornillas.
- Una caseta de cobro instalada en el acceso principal.
- Areas para estacionamiento sin acondicionar.
- Dos kilómetros de carretera pavimentada en mal estado.

En cuanto al contexto ambiental, el parque se encuentra en una zona altamente contaminada por humo, ruido y rodeado por la zona urbana. Quedando el parque como un islote semidesnudo en la zona Norte de la Metropoli.

Existen áreas dentro del parque que han sido usadas como depósitos de basura y cascajo de las construcciones ahi asentadas. La escasa vigilancia ha permitido el consumo excesivo de bebidas embriagantes, afloro del pandillerismo y drogadicción. Esta problemática se ve acentuada por el hecho de que el personal con que cuenta el parque no tiene la preparación ni las herramientas adecuadas para hacer frente a esta situación. Los programas de reforestación se practican periódicamente por grupos de voluntarios, ecologistas y personal de la Secretaría de Desarrollo Urbano y Ecología, sin embargo el proceso de reforestación no es respaldado por acciones de seguimiento. Ademas existe tala clandestina dentro del parque.

Un elemento importante del que carece el parque es la señalizacion interna y de acceso. Esta deficiencia provoca que muy poca gente acuda al mismo atraída por publicidad o señales de su ubicación. Los elementos que guardan el límite del parque se encuentran sumamente deteriorados por lo cual su función es mínima y el resguardo y delimitación que ofrecen al parque son casi nulas.

Parque Nacional "Cerro de la Estrella", fue decretado el 27 de julio de 1938 por el presidente Gral. Lazaro Cardenas. Para considerarlo Parque Nacional se tomó en consideración que constituye un lugar de alto valor histórico, ya que era un centro ceremonial en la época prehispánica, donde los méxicas renovaban periódicamente el fuego sagrado, en la celebración de "El Fuego Nuevo" que se realizaba cada 52 años.

El parque se encuentra ubicado al Sureste de la ciudad de México, bajo la juridicción política de la Delegación Iztapalapa.

Hoy en día los límites del parque no estan bien definidos y no son claros para el visitante, debido a la poca vigilancia que se tiene sobre el crecimiento urbano y los asentamientos irregulares en los alrededores del cerro, gran parte de la falda se encuentra ya ocupada por construcciones, incluso algunas oficiales. Debido a esto los límites originales han cambiado e incluso ruinas arqueológicas que se localizan en la parte baja han sido absorbidas y actualmente se encuentran dentro de un lote baldío abandonado.

Culturalmente el parque cuenta con tres atractivos que le dan al parque una importancia nacional. Estos son:

Las ruinas arquelógicas que aún cuando no tienen valor arquitectónico notable, radica su interés en su simbolismo y representatividad de la ceremonia del Fuego Nuevo.

La ceremonia del Fuego Nuevo, era el evento de mayor trascendencia en el mundo prehispánico ya que marcaba el principio de un nuevo siglo. Actualmente la ceremonia es representada en abril y en ocasiones especiales como los Juegos Panamericanos, ya que de ahi se lleva el fuego olímpico.

El tercer evento es la representación de la Pasión y Crucifixión de Cristo, durante la época de Semana Santa. Esto se ha convertido en una tradición nacional y representa un punto de identificación del Cerro de la Estrella.

Los visitantes asisten al parque principalmente en celebraciones o actividades específicas (semana santa, ceremonia del fuego nuevo y competencias atléticas). El principal problema se debe a la falta de vigilancia, instalaciones y mantenimiento, lo que ocasiona que el visitante no asista con regularidad. Existe un alto índice de delincuencia, vandalismo y drogadicción dentro del límite del parque. Este se encuentra bajo la juridicción de SEDUE, INAH, DDF y Delegación Iztapalapa, sin embargo no se definen y delimitan responsabilidades quedando el parque sin manejo.

Zonificación del parque. Zona de uso intensivo. La totalidad del parque es utilizado de manera irregular, desmedida y dejándolo sin posibilidades de regeneración.

Zona Histórico-Cultural. El parque cuenta con una zona arqueológica en la cima del cerro y en una parte de la falda, que dan al sitio características únicas. Existen ademas cuevas naturales que contienen restos de enterramientos y pinturas rupestres.

Zona de uso especial. Dentro de esta clasificación englobamos áreas deportivas, áreas de basureros clandestinos y zonas de agricultura. Existe un área de reforestación con Eucaliptus spp, siendo la única que cuenta con vegetación importante en el parque ya que el resto se encuentra totalmente deforestado, erosionado y con muy poca vegetación arbustiva.

THE OZONE LAYER--WHOSE RESPONSIBILITY

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Abstract

To appreciate why ozone depreciation is a major environmental concern for the up-coming century and beyond, the process of breakdown must be understood.

Ozone, a form of oxygen found in the stratosphere, protects us from ultra-violet radiation. CFCs exposed to ultraviolet light break down, and in the process destroy ozone.

The atmosphere is a mixture of several gases and scientists find it convenient to divide the atmosphere into layers. One of these layers is called the stratosphere and contained within is the ozone layer. Ozone is a key feature of the ecosystem of the Earth. It is a pale blue gas that has a characteristic pungent odor. Even in small concentrations it is poisonous to human life. With these facts in mind, why is there so much concern about this substance? It does have some rather important uses.

It is estimated that the ozone layer contains between four and five billion tons of ozone. Ozone is constantly being created in the stratosphere by intense ultraviolet radiation. This is a naturally occurring process in which the radiation splits ordinary oxygen molecules (O_2) and these free atoms join with other oxygen molecules to form ozone (O_3). While two atom oxygen molecules do not effectively absorb ultraviolet radiation, ozone does, thus preventing harmful rays from reaching the surface of the earth.

Chlorofluorocarbons (CFCs) were discovered in 1928 by a DuPont chemist named Thomas Midgeley Jr. He was looking for a better coolant that could be used in refrigeration. His discovery was nontoxic, nonflammable and stable. He decided to call them fluorocarbons because they contained carbon and one or more of the class of halogen elements (fluorine, chlorine, bromine, iodine).

Being stable, the CFCs would never break down on the surface of the planet. They do not dissolve in oceans, do not get washed out of the air by rain, and gradually work their way upward into the stratosphere. These CFCs would rise slowly, over a period of 50 to 100 years, into the stratosphere, some 10 to 30 miles above the ground. Once these CFCs reach this height, they are subjected to intense ultraviolet radiation, radiation that severs the compound's tight chemical bonds, releasing highly reactive chlorine atoms. Once liberated, the chlorine would react swiftly and repeatedly with stratospheric ozone--and destroy it.

At the same time, ozone molecules are constantly being destroyed by gaseous compounds that reach the stratosphere and are broken apart by ultraviolet light. Some of these are natural, such as methane, a gas formed by decomposing matter.

Chlorine has thrown the cycle out of balance. Freed from its atomic bonds, each chlorine atom would readily attack a highly unstable molecule of ozone, binding with one of the oxygen atoms to form a chemical fragment with an odd number of electrons, called *chlorine monoxide (CLO)* and O_2. Chlorine monoxide is a free radical, meaning it is unstable and highly reactive. Having an odd electron guarantees that it will react with any free oxygen atom with which it comes in contact. This free oxygen atom breaks up CLO, causing the oxygen atoms to pair, and releasing a free chlorine. This free chlorine is now able to attack another ozone. Every free chlorine atom can attack about 100,000 ozone molecules, turning them into oxygen.

A University of Toronto chemistry professor (Schiff) was the first to measure the speed of reaction between nitric oxide and ozone. Nitrate fertilizers are used on the soil (10% used in the United States is on golf courses). Nitrous oxide is added to the atmosphere every time coal and oil are burned. Nitrous oxide (laughing gas) is used as an aerosol propellant in such things as whipped cream. It can also be emitted from natural sources such as solar flares. Nitrogen oxide is released in the exhaust of high flying jets.

Several hundred million tons of N_2O are released into the atmosphere each year. Only a few tons have managed to rise to the stratosphere. With a lifespan of 150 years, it is a substance to cause concern.

Ultraviolet radiation could convert the nitrous oxide to nitric acid. NASA's Marshall Space Flight Center looked into the environmental effects of space shuttle flights, because of the hydrogen chlorine emissions from the solid fuel rockets. One good part is that chlorine oxide combines with nitrogen oxides to produce chlorine nitrate. This chemical reaction ties up chlorine.

The holes appear in the ozone over the polar regions, due to the low temperatures. The polar vortex, which forms after the March equinox, is very cold stagnant air. Polar Stratospheric Clouds (PSC) are formed out of nitric acid and water. At -108°F these clouds form out of liquid droplets. Below -117°F, freezing occurs because of the low pressure in the hole. Here, temperatures have been measured at -130°F because of the lack of ozone heating the air.

Hydrochloric acid and chlorine nitrate can react in ice particles to release chlorine radicals that can attack ozone. Methane breaks down and releases hydrogen. This hydrogen combines with oxygen to form water that can freeze in clouds. The surface of these particles provides a place where chemical reactions that release chlorine gas can take place.

$ClONO_2$ (surface) + HCl (solid state) --> Cl_2 (gas) + HNO_3 (surface)

$ClONO_2$ (surface) + H_2O (ice) --> $HOCl$ (gas) + HNO_3 (surface)

Simply removing nitric acid (HNO_3) from the gases in the atmosphere, by freezing it, will also directly influence the release of chlorine from hydrochloric acid. Molecules of nitric acid are very effective in removing (OH) hydroxyl from the stratosphere but if the nitric acid has frozen out, the amount of OH can build up.

$OH + HCl \rightarrow H_2O + Cl$

Measurements in the region of ozone depletion do, indeed, show very low concentrations of HCl. In 1964, Canadian John Hampson proposed that oxides of hydrogen, which are free radicals given off from water vapor, could be created in the stratosphere and react with ozone.

Life, including human life, is particularly sensitive to ultraviolet radiation. Biologically active ultraviolet (UV-B) causes sunburn and skin cancer. It has been estimated that for every 1% decrease in ozone there will be a 5% increase in skin cancers (10,000 to 20,000 victims a year). Radiation also suppresses the human immune system. Ultraviolet light below 290 nm (UV-C) can destroy nucleic acids (RNA & DNA) and protein.

Increased UV-B radiation on the ocean surface reduces phytoplankton productivity. Other effects that have been discovered are that when UV-B is increased 25% soybean crops suffer a 25% decrease in yield. Increased exposure to UV causes an increase in cancer eye (pink eye) in cattle. A University of Maryland study tested 200 species of plants exposed to UV-B and recorded cell and tissue damage in two-thirds.

Losses in ozone over the Arctic have started to register. The concern here is that most of the world population lives in the northern hemisphere, and that more ultraviolet light is reaching the earth than at any time in earth's modern history. Fortunately, in the Arctic the temperatures do not fall quite as low as in the Antarctic. The north polar stratosphere usually stays 18°F or more warmer than the Antarctic stratosphere. Arctic PSC is formed higher and composed of liquid drops rather than ice crystals. However, a cooling of 18°F over the Arctic would allow the kind of icy PSC that now form only over the Antarctic, to appear in the north.

In 1988, the losses in the northern hemisphere were measured to be between 1% and 3% and up to 6% in some areas. In the north, a 1% loss of ozone means a 2% increase in UV reaching the surface. This is estimated to mean a 10% increase in skin cancer.

In the Arctic temperatures drop to -112°F, cold enough to allow ice crystals of water and nitric acid to form. A 1989 Arctic mission (NASA) determined that there are enough chlorine chemicals in the Arctic to cause the observed 5% reduction of ozone. The problems seems to be that during the long polar night chemical processes occur, that, as far as we know, occur naturally nowhere else on the earth. The key to release of chlorine is the very low temperature of the winter stratosphere.

By 1973 CFCs were being produced worldwide at a rate of one million tons a year. More than two billion aerosol cans rolled off production lines, translating into 14 aerosol cans a year per person in the United States. In 1974, in the United States, CFC production was worth $500 million, had a payroll of $6.7 billion, and employed 2 million workers. By 1986, some 2.5 billion pounds of CFCs were used worldwide. Of this, 700 million pounds were consumed in the United States (3 lbs per person). Presently it is an $8 billion industry in this country.

Where does responsibility lie? It is true that nature is responsible for some of the change, but the majority of the destruction is man-made. Modern technology and lifestyles must be monitored if we want to protect the ozone layer.

CFCs and halons account for an estimated 25% of the greenhouse gases. Ozone depletion and global warming are inexorably interconnected. Cuts of 60% are needed, but consumption is predicted to double in the next 40 years. If total phaseout came tomorrow, we would be reminded of their devastating effects well into the twenty-second century.

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NATURE INVESTIGATIONS AS BLIND ALLEYS IN ENVIRONMENTAL EDUCATION

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Nature investigations traditionally have a prominent position in EE. But in the future where we have to pay still more attention to the conflicting values involved in the solution of environmental issues, the investigation of nature might provide the students with a naive picture of the real world. The presentation builds upon the author's work with the development of EE in Denmark.

ENVIRONMENTAL EDUCATION PROGRAMS FOR INDUSTRY: A CHALLENGE FOR THE 1990s

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Abstract

There is an urgent need for environmental education programs for industry, particularly primary-resource industry where workers have a direct impact on the environment. Successful programming requires the use of adult education principles in both design and implementation. The author examines an environmental awareness training program for 1200 pulp and paper employees in Nova Scotia, Canada.

Need For Education In The Industry Sector

To change society's environmental values and actions we must reach wider audiences. The industrial sector, especially primary-resource industry, is a target we often have failed to reach. There are two reasons for this failure: industry's traditional reluctance to recognize the importance of environmental education; and our unwillingness or inability as educators to build relationships with industry and to formulate programs based on principles of adult education.

Industry's mood is changing. Many executives now acknowledge the need to be more environmentally responsible because of increasing legislation, consumer demand, and employee concern. This change opens a door for educators but it presents many challenges.

I faced these challenges in designing an environmental awareness program for the 1200 employees of a pulp and paper company in Nova Scotia (Stora Forest Industries, Port Hawkesbury). These basic challenges were: to gain management trust; to design an honest and relevant curriculum; to ensure employee input in the learning process; and to design a program which would have a long-term impact.

Trust

Both company executives and I were jittery in initial meetings. I was concerned about compromising my principles; they on the other hand, were used to repeated public criticism from environmentalists, and uneasy about opening their "environmental books" to someone who preached radical change. However, senior management was committed to education, and willing to admit areas where practices needed to be improved.

There are several important building blocks in the development of trust. First, educators must be able to participate in constructive dialogue based on a sensitivity to the constraints and practical problems faced by the industry. Knowledge of technological and economic realities is crucial. Second, educators must deal honestly with the company in terms of clearly communicating personal feelings, beliefs, and knowledge limitations. Done in a business-like, non-confrontational way, this explicitness is appreciated. Third, educators must show enthusiasm and knowledge about environmental issues.

Fourth, and most importantly is that educators must negotiate as an adult educators not as an environmental mission. The language of adult education is a language of goals and evaluation; it is a language that industry can understand and relate to. It is crucial for educators to familiarize themselves with this theoretical field. It surprised me, not only in my dealings with industry, but with other institutions as well, that the basic principles of adult education (needs assessments, self-directed learning, and formative evaluation) are not commonly known. Too often, environmental educators stress the message rather than the medium by which the message should be conveyed, and tend to rely on conventional pedagogical approaches inappropriate for adults. Being familiar with the language and practices of adult education allowed me to walk through a door which had been opened by a company willing to educate its employees, but fundamentally unsure of how to go about doing it.

Relevance And Honesty

Two cornerstones of adult education are understanding the learners and making the program relevant to their needs and interests (Brundage and MacKeracher, 1980; Knowles, 1980). Relevant programming is honest programming. Adults are quick to react with cynicism or indifference if they sense irrelevance.

From previous experience in forestry education I knew that many Stora employees would have a potentially high level of cynicism. But I also knew that, as adults, they would respond to programming that was clearly based on their own learning needs.

Thus, in order to design a program the first step was to convince the company of the usefulness of a comprehensive needs assessment for both employees and management. The turning point was the issue of relevance and the perceived long-term benefit. First I conducted an employee survey on specific learning needs and criteria for a successful program. Second, I held a workshop with management to determine desired outcomes of the program. Both employees and management demonstrated enthusiasm and appreciation at being solicited for their views. Much goodwill was generated even before the program had been designed. The needs assessments were important for giving us information but they also set a climate which showed that the company was interested in their employees' points of view.

Senior managers, I think, were surprised, as I was, by the degree of worker concern for relevance and by the general interest in improving environmental practices. They were also surprised that employees wanted very much the same program as they did.

The energy of the response confirmed the company's initial recognition that the program would have to honest in its examination of actual environmental practices and issues. To ensure that the material was not perceived as a "white-wash" we agreed that the company would have to "tell it like it was".

Employee Input

One of the concerns of adult education is learner participation. We had established a climate for this in the needs assessment; and we followed this through in program design. For example, we provided opportunities for participants to learn from each other by combining different types of employees in every session. Every employee from janitor to vice president was treated equally in having the opportunity to provide input.

A key design element was to develop an environmental policy for the company based on workshop discussion. The employees would "own" the corporate environmental policy through their recommendations. These policies would be grounded in the practical realities of plant operations because employees themselves would be responsible for implementation.

To increase trust between management and employees a senior manager was present at every session, participating fully and answering questions. This accomplished two tasks at one stroke: employees were more convinced that management was serious, and management became even more serious as they listened to, and observed employee responses.

Building these elements into the program design created tremendous logistical constraints.

1. The workshop approach took four months to train 1200 people (25 people per day, four days per week).

2. The 1200 woodlands and mill employees had to be scheduled so that operations would not be affected.

3. Because the adult education approach was new, facilitators had to be trained to understand adult learning and group process techniques.

4. Course materials, hand-outs, and displays all had to be prepared "from scratch". There were few course materials we could borrow from anywhere else.

The Stora program was facilitated from February until May of 1990 and has been successful beyond the expectations of the company. Basically the content covered the following: An overview of global, woodlands, and mill issues; brainstorming on individual environmental actions; an overview of the pulp and paper process; and finally a workshop where employees collectively designed environmental policy statements for the company.

Employees expressed enthusiasm for this program which surprised everyone. So much interest and enthusiasm was generated that a mini-version of the program was held for all interested spouses of Stora employees.

I can best illustrate this through the comments of one mill worker who monitors air emissions. In the morning he said he felt "quite cynical". "After all", he said, "there's not much I can do. I'm just an average guy, what difference can I make"?

I watched this man's interest and excitement grow throughout the day. At the end of the program he said something along the following lines:

> "Thanks. I wasn't looking forward to this day and I wasn't prepared to listen. I was surprised that the company was so honest and at how bad the world situation is. This program is going to make a big difference. We all know we have to try harder. You came in and were willing to listen; you didn't come in and assume we're all bad to begin with. We want to do a better job, but we need this kind of education. I especially liked the discussions and that I had a chance to give my opinion."

Conduct A Meaningful Evaluation

The final challenge in the program was to design a follow-up. Evaluation is one of the chief instruments for program follow-up. To help ensure this, every employee received an information binder at the end of the program. This binder included: responses to questions that could not be answered during the program; results of the policy workshops; lists of actions employees could do at work and home; and a description of the follow-up strategy (currently being designed). The program was also evaluated by the following:

1. Post-workshop reaction forms to evaluate how well the program met objectives and to rate facilities, course design, and delivery.

2. An attitude survey administered to a randomly chosen group of 250 employees for their attitudes towards environmental responsibility and management views pre-course, post-course (immediately), and post-course (six months).

Summary

If the 1990s are to be the turn-around decade, one of our primary targets must be industry. Although not all industries are as far-sighted and open as Stora, this experience, using an adult education approach, may be a model that others can use with confidence and success.

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MULTI-CULTURAL CHALLENGE TO ENVIRONMENTAL EDUCATORS

Kay K. Antunez de Mayolo
Sacramento, California

In California, the minority multicultural populations have collectively become a majority. Environmental educators will continue to be given challenges in their efforts to introduce diverse audiences to shared environmental values. The presenter will offer insight on differing cultural/environmental perspectives and facilitate an open group discussion to explore this theme.

STRATEGIES FOR ETHICALLY TEACHING ABOUT ISSUES

Vern Fridley
Utah State University
Salt Lake City, Utah

Teachers in public schools have an ethical imperative to teach "fairly" about environmental issues. It is not OK to present only their personal points of view. Strategies exist by which teachers can maintain neutrality while students explore issues and evaluate possible solutions. This session will examine six strategies.

STOP TEACHING KIDS!

Alan Lee Hankin, PHD
Lloyd Center for Environmental Studies
South Dartmouth, Massachusetts

How are we targeting our environmental education resources and are we getting the most return from this investment? This presentation will address the issues, problems and methods which have been employed to refocus public education resources to educate and change the behaviors of adult "change agents" in Massachusetts coastal communities.

REACHING EDUCATORS

David Holland
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Abstract

Various techniques and emphasis gleaned from preparing, promoting and conducting teacher training workshops in waste management are the basis for discussing:

- -the rationale,
- -finding the right carrot,
- -chasing the train (keeping abreast),
- -getting it right (the importance of credibility)
- -finding the goalpost (the value of relevance).

This paper is based on my experience presenting solid waste management workshops to the Washington State Department of Ecology's Central Region. The Central Region is a predominantly rural area encompassing seven counties in the central one-third of Washington State. These teacher training workshops introduce the Department of Ecology's A-Way With Waste curriculum and focus on waste reduction, recycling, energy recovery, economics, and environmental action. The following insights, while based on teacher oriented waste management workshops, should be of value to any environmental workshop leader.

The Rationale

The goal of the A-Way With Waste (AWWW) program is to introduce as many grades K-12 students as possible to the causes, issues, and solutions of waste management problems and issues. We are attempting to achieve this goal primarily through training teachers. The rationale for training teachers rather than students directly is based on what I will label the multiplier effect and the cumulative effect.

The multiplier effect is basically the concept that while a classroom presentation might reach 30 students with a single half hour message, a teacher training workshop of 20 teachers should reach at least 20 classrooms of students. For example, if one grades K-6 workshop consisted of 20 teachers who had an average class size of 30 students each, then the potential students reached as a result should amount to 600 children. If our example was extended to a grades 7-12 teacher workshop and if these 20 teachers introduced the curriculum material in only four class periods averaging 30 students per class, then the number of students reached would be raised to 2,400. Thus, one workshop might reach anywhere from 600 to 2,400 students depending on the teacher group targeted. A total of six workshops per year (three grades K-6 and three grades 7-12) could amount to over 9,000 students being reached.

The cumulative effect has the potential of being even more significant. If only 50 percent of the teachers who took the AWWW workshop in the previous five years continued to include waste management topics in their curriculum, then the cumulative effect of these previous workshop participants added to teachers being trained this year could result in over 31,500 students being reached annually with the AWWW message (9,000 + 5 * .5(9,000) = 31,500).

Finding The Right Carrot

The first difficulty we face is how to attract teachers who are interested in waste issues, but are often limited in time and resources. In order to enable and encourage teachers to attend our workshops we incorporate adaptability, affordability, and achievement recognition.

Adaptability refers to the various workshop lengths, schedule arrangements, and constituencies to whom we can tailor workshops. AWWW workshops can range from three hours to ten hours. They can be scheduled for in-service, evening, or on weekends. The workshop can be offered to an individual school, an entire school district, or to a multi-county educational service district.

Affordability is enhanced by providing participants with curriculum books, resource materials, and substitute teacher pay reimbursement.

Achievement recognition is a capricious reference to two types of workshop credit offerings available. Workshops three hours or longer can be approved for Washington State's Continuing Education Clock Hour credit. College credit can be earned by teachers who take the ten hour workshop.

In our rural region the "carrot" of substitute reimbursement by itself attracted some teachers, but seldom did it attract enough to fill a workshop. The same was true of the college credit "carrot". The low attendance hurdle was overcome when the right combination of substitute reimbursement and college credit was discovered. The successful combination for us was offering substitute reimbursement to all teachers for a six-hour Friday class and those interested in receiving college credit could attend an additional four hour class on Saturday. This combination of credit and non-credit students has been extremely successful.

Promotion of the AWWW workshop is also important especially in the sparsely populated counties of Central Washington. Promotion is accomplished by sending flyers to all teachers in the targeted cities.

Finding the right carrots to attract workshop participants is just the beginning of successful workshops.

Chasing The Train

One major challenge in the solid waste field is keeping abreast of the continuing influx of new regulations, technological innovations, research findings, marketing developments, and other constantly changing factors of influence. Trying to stay abreast of these changes is like "chasing the train"; one must run hard to keep up.

Information which was new, innovative, and relatively unknown a couple of years ago is often common knowledge this year. Also, facts and figures illustrating yesterday's solid waste situation are today often inaccurate or irrelevant. I have discovered that in order to present a quality workshop, one must invest a significant amount of time reading current reports, journals, studies, and attending conferences. Finally, it is also important to convey to workshop participants that in order for them to remain updated in current solid waste issues they also need to "chase the train".

Getting It Right

I often begin my workshops by showing the following three headlines from the Bellingham Herald:

July 20, 1989 - "Consultant: no threat in burning medical waste"

July 21, 1989 - "Scientist: burning medical waste a problem"

July 24, 1989 - "Trash conflicts contradiction, confusion reign amidst scientific presentations"

Besides injecting humor, these articles typify the problem faced in trying to acquire accurate information concerning environmental issues. Experts can be found supporting differing sides of an environmental issue. The result is confusion as to "who's right?" Integrity for one's position on environmental issues is enhanced by using information based on its accuracy rather than its popularity or its conformability to one's predisposed opinions. A significant amount of workshop time is spent attempting to clarify misperceptions based on well-intended, but inaccurate or misrepresented information. Many misperceptions stem from attempts to apply simple solutions to complex problems. Credibility is essential if environmentalists' messages are to be taken seriously rather than discounted.

One example of the credibility issue occurred when I examined information being distributed by my own agency. The figures given in our own educational materials for the annual amount of waste generated per capita varied greatly. While most estimates ranged between 2.3 and 6 pounds per day, one estimate exceeded 25 pounds per day. Most differences could be explained, but only after doing some research to discover which segments of the waste stream were included. The lower figures were based on residential waste only while the higher estimates included varying mixes and matches of commercial, industrial, manufacturing, self haul, mining, and agricultural waste streams. (However, I was never able to locate the basis for the inordinately high estimate of 29 pounds per person per day.)

If we as environmentally concerned educators wish to be taken seriously, then we should invest our time and resources presenting legitimate issues and use verifiable information.

Finding The Goalpost

What's so attractive about a class on garbage? Until the infamous "garbage barge" incident caused major media attention to be focused on solid waste issues, there was little awareness in Central Washington concerning the growing waste problem. The prevailing perception was that garbage, if it was a problem, it was someone else's problem and it did not concern us locals. This perception was cracked by the garbage barge incident and shattered when Seattle proposed to dispose of their municipal waste in our region of the State.

While learning about garbage and its alternatives may never be attractive it can be very interesting when it becomes relevant. Relevance is a catalyst which can motivate teachers, students, or the general public from complacency to interest and action. Relevance can be facilitated by emphasizing both local ramifications resulting from environmental problems, regulations, or inaction, and local opportunities for solutions.

The local ramifications of both proper and improper waste management are presented through visual aids and discussion of local landfill issues and basic environmental economics. When possible, I use a local solid waste professional to assist in discussing these problems and issues, including expected garbage rate increases. Data showing quantities and percentage of local recycling and waste stream activities are also used if available.

Opportunities for positive change through personal action are emphasized. This is facilitated by inviting a recycling operator to discuss local recycling markets and opportunities, by encouraging school recycling, home recycling, and waste reduction opportunities, and by providing teachers with grade relevant workshop activities.

Curriculum relevance is enhanced by developing and sponsoring junior high/high school workshops separately from elementary grade level workshops. This change dramatically increased enrollment of grades 7-12 teachers. This change also permitted the workshop to focus on material which is more applicable to the respective grade levels.

Summary

Regardless of the field of study, environmental education can be enhanced through these the following proposed guidelines:

1. Attract your audience's attention by finding the right"carrot".

2. Keep abreast with the voluminous output of new information and constantly changing developments.

3. Develop credibility by using accurate and supportable formation.

4. Retain your audience by making your information relevant.

THE ORANGUTANS OF TANJUNG PUTING RESERVE: SPECIES AND HABITAT IN PERIL

Sherri Houser
Argyle, Texas

For the past 20 years Dr. Birute' Galdikas, world renowned primatologist, has been conducting the most comprehensive study ever on the plight of the orangutans of Borneo. This presentation will include a slide presentation and discussion of the orangutans of Tanjung Puting and the current destruction of their tropical rainforest habitat.

THE DELTA WORKS AND THE EASTERN SCHELDT

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Abstract

The story of the Delta Works, a storm surge barrier to protect low lands in the Netherlands, demonstrates how the potential impact on the Eastern Scheldt ecosystem was recognized before completion of the project. It also shows how conservation groups and government agencies worked together to modify the project so that the ecosystem of the Eastern Scheldt would not be significantly changed.

Introduction

The Delta Project is the most recent development by the Netherlands in its continuous struggle with the sea. Significant floods have been documented over the centuries. The last and most devastating flood occurred in 1953. Dikes, dams, sluices, canals and windmills have been used in the fight against the sea.

After the flood of 1953 two projects were undertaken to protect the low areas from floods and also to provide more usable land. The first was the Zuider Zee Project, and the last, the Delta Project, which was completed in 1986. This project is interesting not only because it was a marvelous engineering feat but also because it aroused environmental citizen groups which were able to force a change in the original plans so that most of the preexisting natural ecosystem of its delta area of the Eastern Scheldt would be preserved.

The Netherlands And The Sea

The Western Netherlands is a low lying strip of land that extends from the mouth of the Western Scheldt to the island of Texel in the north. Three great rivers, the Rhine, the Maas, and the Scheldt pass through this region to the North Sea.

As a result of drainage, peat bogs subsided to below sea level from a former elevation above sea level and became subject to flooding. These are the areas that need protection today.

The occurrence of several significant floods has been documented and the floods named after Saints' days. These are:

Saint Aechten's Day Flood in	*1288*
Saint Elizabeth's Day Flood in	*1404 and 1421*
Saint Felix's Day Flood in	*1570*
In the present century	*1906*
	1916
The greatest flood February 1	*1953*

During this most recent major flood the damage was great:

- 200,000 hectares of farmland were flooded.
- Dikes were destroyed in 67 places.
- Dikes were breached in over 400 places.
- 1,835 people drowned.
- 72,000 people were forced to evacuate.
- 200,000 cows, horses, pigs and other domestic animals died.
- 47,000 buildings were destroyed. (Ministry of Transport and Public Works 1989)

The Delta Of The Eastern Scheldt

The estuary of the Eastern Scheldt is known as the "golden border of the sea" (van Westen 1987) because of its faunal and floral diversity. Van Westen reports that there are 190 species of phytoplankton and zoo plankton, 144 species of algae and water plants, 325 species of benthic organisms, 70 species of fish, and 25 species of birds in the estuary.

Because the water temperature is relatively high and the fresh water is relatively clear the Eastern Scheldt estuary is unique. Some of the plants and birds, numbered above, normally are found only in more southern areas. (van Westen 1987) The fresh water mixing with the salt water provides a saline gradient with vegetation that favors brackish conditions inland and with halophyts growing nearer the sea, thereby increasing the opportunity for diversity. Sand and silt are carried and deposited by the river creating islands. Estuaries serve as nurseries. With the tidal movement mud flats are periodically exposed and offer birds the opportunity for feeding.

Thijs Kramer from the Zeeland Environmental Association has reported that "According to international standards, an area is of importance for birds in case 1% of the total species population stays in the area regularly." He reports that the Eastern Scheldt estuary meets and in some cases surpasses this norm for 25 bird species among which are the Dunlin, Brent Goose and Avocet. He also says the more than 10% of the world's Oyster Catchers stay in the Eastern Scheldt for some part of the year. He says that not only does the Eastern Scheldt provide a "filling station function" for migrating birds but also offers important bird wintering habitat. (Kramer 1989) Both van Westen and Kramer stress the attractiveness of tidal areas for recreation and tourism and how threatening such activities can be to the natural flora and fauna. A dam across the Eastern Scheldt would have destroyed this ecosystem. The fishing industry and the shellfish farms would have disappeared.

The Delta Project

The Delta Project was designed to prevent flood disasters in the future. It features the following structures listed below with their dates of completion.

1958	Storm surge barrier in the Hollands IJssel
1960	Zandkreek Dam
1961	Veerse Dam
1965	Grevelingen Dam
1970	Volkerak Dam with lock complex
1971	Haringvliet Dam with discharge sluices
1972	Brouwers Dam
1986	Eastern Scheldt Storm Surge Barrier with Philip's Dam Oester Dam

The dams of 1958 through 1972 created fresh water impoundments and stagnant salt water impoundments. (Offringa 1987) The final phase at the delta of the Eastern Scheldt was originally planned as another dam.

Throughout historical time the Dutch have fought the sea but have also used it for trading. It has been important to their economy. The planners for the Delta Project considered this. Shipping continues and will continue. The Western Scheldt remains open as well as the New Waterway to permit shipping to Rotterdam and Antwerp. All other tidal inlets were planned to be closed. The Eastern Scheldt had had complete closure planned for it but the issues raised by concerned citizens forced a change in plans to allow the Eastern Scheldt to be kept open under normal circumstances but closed when storm surges were anticipated.

Because the environmental groups raised such a loud voice against closing the Eastern Scheldt completely and totally destroying the estuary ecosystem, the Dutch government had a new study done. The purpose of this study was to see if it were technically feasible to keep the Eastern Scheldt open so that as much of the natural ecosystem as possible could be preserved while providing the flood protection necessary for the safety of the people living in the delta. The results of the study indicated that there was a way to accomplish this objective. (Offringa, 1987)

Instead of building a massive dam across the mouth of the river, the Dutch engineers designed and built two dams and the storm surge barrier. There were three tidal channels, the Hammen Channel, the Schaar van Roggenplaat channel and the Roompat Channel. Because the original plan had called for the construction of two islands, Roggenplaat and Geul, had already been built at shallow areas in the estuary. Two other islands, Neeltje Jans and Noorland were built connected to Geul. Neeltje Jans was used as a construction island and as a site for building prefabricated parts of the storm surge barrier. (Offringa, 1987)

The storm surge barrier reduced the tide to some extent and therefore required the construction of the dams inland of the barrier. The tidal area was reduced in order to maintain the necessary difference in high and low tides that was important to the fishing industry. It also provided a non-tidal shipping lane to Rotterdam and Antwerp. Salt water and fresh water were also separated. Fresh water lakes were formed behind Philips Dam and the Oester Dam. A discharge canal was dredged connecting the Eastern Scheldt to the Western Scheldt that controls the level and quality of the water in the lakes. Another canal was built to accommodate the pushing of vessels by barges.

The storm surge barrier itself is 3,000 meters long. It consists of 65 prefabricated piers with 62 sliding gates between them. With the gates in a raised position the tidal action remains three quarters of its original range. This provides for the protection of much of the estuary. When storms and extremely high water are imminent, the gates are closed protecting the population from the sea. (Offringa, 1987)

A road has been constructed across the top of the storm surge barrier providing access to the islands for recreation. Sailing conditions have improved so that larger yachts can be accommodated. People disturb the mud-sand flats by gathering marine worms for fishing bait. People also collect sea weed and shells. Sailors beach their boats on the mud flats. Water sports in addition to yachting, such as wind surfing and diving have increased. Tourists have become careless with the disposal of paper, cans, and plastic. Oil from boats and materials from chemical toilets are also causing concern. (Kramer, 1989)

Some other problems have emerged. The problems associated with shipping relate primarily to the risks of transporting hazardous products such as chemicals and oil. Accidents could occur causing pollution of the water and oysters, damage to birds, fish, and benthic organisms. The mollusc culture is a vital one in the region and has not been severely impacted by the Delta Project. This culture does utilize huge amounts of nutrients in the water and has the potential for being detrimental if the area devoted to it becomes much larger. The maintenance of the dikes surrounding the Delta Project does require use of asphalting on the side slopes of the dikes. This practice destroys useful sea weeds and precludes the regrowth of the weeds. (Kramer, 1989)

Policies And Management

The Eastern Scheldt Steering Committee, organized in 1977, consists of representatives from the central government, regional authorities of the province of Zeeland, communities along the Eastern Scheldt, and local water management authorities. This committee has adopted a plan that allows each member to retain his/her own responsibilities but also provides the policies that guide the management of the project. The principle objective of this management plan has been stated as, "The conservation, and if possible, strengthening of natural values, taking into account the basic conditions for a good societal functioning of the area with special reference to fisheries" (Kramer, 1989)

The Result

Thijs Kramer has expressed concern over the threats to the natural environment that are a result of the creation of the storm surge barrier and the increased use of the delta for recreation. His concerns are based on the disturbance of the area by humans that could cause problems for birds and seals. Human activity on the mud flats could prevent migratory birds from getting enough food. Activities in the marshes could interfere with the breeding of some birds. Seals are not afraid of people when they are in the water and Kramer is afraid that during periods of giving birth and suckling the disturbances may be so great that the chances for the survival of the pups may be diminished. (Kramer, 1989)

Kramer says that pressure has been increased on the "natural values of the Eastern Scheldt" and that therefore the major management objective has not been reached. He says that the natural values have been degraded and that no strengthening of these natural values has taken place. He uses records of bird populations to support his argument, stating that 6 out of 9 bird species populations have declined in number while 3 have remained stable. He is concerned that the possibilities for birds to eat and rest in the Eastern Scheldt have been reduced. Kramer does say that the hydraulic works have been built so that the environmental values can be preserved. But he says that unless a quiet and undisturbed Eastern Scheldt is created, the community will continue to have problems. (Kramer, 1989)

The current problems are not unique to the Eastern Scheldt. coastal lands have been and will continue to be valued as lands for recreation. Recreation is not always compatible with the maintenance of ecological values. The storm surge barrier has not been tested. When the gates are lowered what will the impact be on the ecosystem? How long can the gates be closed and still protect the tidal ecosystem? Studies are being conducted to answer these questions.

The Dutch are proud of this immense undertaking using well proven techniques along with newly developed ones. This new "know-how" can be used in other parts of the world subject to flooding from the sea. It is important that the Zeeland Environmental Association continue its monitoring and evaluation of the impact of the storm surge barrier on the ecology of the Eastern Scheldt. Because the membership in this association is so diverse, covering national, regional, and local governments as well as concerned citizens, all concerns will be addressed not only ecological ones. The fishing industry, recreation, and shipping will all be evaluated. A part of this evaluation must, of course, address the issue of what the area would be like without the storm surge barrier.

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ENVIRONMENTAL EDUCATION, PROBLEM SOLVING, AND SOME HUMILITY PLEASE

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Abstract

Action and problem solving are two concepts, frequently linked, which are central to many goal statements for environmental education. However, it is often not clear what is meant by these terms and the extent to which they are educationally justifiable. This paper examines some misconceptions about the roles of action and problem solving in environmental education.

A significant challenge for environmental educators in the 1990s will be to seriously re-examine their goals. Environmental concern has recently become an important part of the public agenda and we can expect increased interest in education to follow. However, if we are to continue having an impact, we must be sure that what we do is logically coherent and educationally sound.

Environmental education has definition and structure, and presumably questions about goals should have been laid to rest years ago (Hungerford, Peyton & Wilke, 1983). While environmental education may have been defined, it is less certain that these definitions are appropriate. Such assertions arise either out of a misunderstanding of the nature of educational discourse, or as Robottom (1987) describes, from "an attempt to control the language of environmental education" (p. 93). In this paper, I assess the concept of "problem solving," and argue that use of this term exaggerates the abilities of environmental educators and students. I conclude that self-confidence must be tempered with humility; we must be more modest in our claims.

Recently Schoenfeld (1989) reported that the birth of environmental education coincided with a rise in public awareness about such problems as pollution, pesticides, population, and people's habits and this field of study mirrored concern for those "problems." The importance given to their solution was reflected in objectives for environmental education identified by Bill Stapp. Among others, he suggested we help individuals acquire:

> A fundamental understanding of the biophysical environmental problems confronting man, how these problems can be solved, and the responsibility of citizens and government to work toward their solution. (1969, p. 31)

Since then, there have been other expressions of the same or similar, aims (Unesco-Unep, 1976; Ramsey, Hungerford & Tomera, 1981; Hungerford and Volk, 1984; North American Association of Environmental Education: Mission Statement). Most recently I find that:

> We are no longer debating whether real-life problem solving and action have places in our goals, curriculum materials, and school programs. (Marcinkowski, 1988-89)

Consider the implications of establishing problem solving as a goal of environmental education. Such talk implies first, that there is a solution, and second, that students are expected to find it. Inability to do so would constitute failure on the part of learners to succeed at a prescribed aim for the activity in which they are engaged. While it makes sense to talk about problem solving in mathematics, I do not believe that the same can be said for environmental education. For example, an algebraic question requires the manipulation of a number of known factors so that the value of an unknown variable can be determined; the answer to such questions are, characteristically, precise and these problems have discrete solutions. It is certainly disputable that environmental problems have such discrete or solvable solutions. In fact, it appears more likely that environmental educators have misappropriated a term which finds its natural home in mathematics. Problem solving denotes a level of precision, exactness and plausibility alien to the careful investigation of environmental issues. Expecting children to solve environmental problems without proper regard for their infinite complexities, is setting them up for potential failure. One can speculate how the resulting failure could be devastating for kids. To continue to urge action which is unattainable and futile is a disservice to persons and serious thought about these issues (Kennedy, 1983). Perhaps we are not sufficiently humble about our understanding of complex environmental phenomena and the limitations of our mission. The inevitable failure, either immediate or masked by a false sense of accomplishment, will be discussed further. First, however, it is important to consider inherent characteristics of the word "problem".

Use of the word problem is normative; by applying this term to a situation, an evaluation has been made. A circumstance may be contentious, but, if we decide that it constitutes a problem, we have made a judgement and decided that it is not to our liking. It follows that the identification of a problem, a necessary condition for its resolution, will in itself be problematic. Consider the difficulties this can pose.

A teacher can cast about, identify problems, and advance these as suggestions for student investigations. This is, of course, unsatisfactory. The suggestions are judged by the teacher; they will not necessarily reflect the concerns of the students; they advance the ethical and political position of the teacher; and, their pre-selection bypasses the critical step of evaluating the issue.

Alternatively, students can select their own problems. Intelligent evaluations will be based on careful consideration of the premises of the competing positions, the logical consistency of the arguments, and the quality of evidence. At least two difficulties face aspiring problem solvers. First, they may select problems with inadequate encouragements to carefully evaluate the issue and perhaps the inability to do so. On the other hand, they may find that after considerable investigation, their problem is, something other than what it once seemed; they might find that they have nothing left to solve, or that they have been barking up the wrong tree. In this case their education and pursuit of truth might get in the way of problem solving. In any case, it should be clear that evaluation of an issue is a rigorous process which must precede any attempts to resolve conditions judged problematic. Further, there is no certainty that the issue investigated will be resolved. This could result in the absurd situation where a student has carried out a thorough investigation, engaged in sophisticated analysis of the available data, rigorously debated the assumptions and arrived at an intelligent conclusion about the issue, yet remains unable to fulfill one of the stated aims of environmental education.

Not withstanding the above difficulties, an environmental problem can be intelligently selected.

Indeed, there are issues which we can broadly agree are problematic, pollution for example. However, as I suggested earlier, these do not appear to offer the promise of concrete or certain solutions in the way that mathematical problems do. This, I will argue, is due to fundamental differences in their inherent natures.

Australian philosopher John Passmore put the distinction succinctly: "an ecological problem is not, in the first place, the same thing as a problem in ecology" (1974, p. 43). By this he means that a problem in ecology is a scientific problem arising out of the fact that scientists do not understand a particular phenomenon. Having identified a gap in their knowledge, they can then employ their various techniques in an attempt to solve the puzzle. On the other hand, an ecological problem (Passmore uses "ecological" here in a way that would be interchangeable with "environmental") is in fact a type of social problem. It is deemed a problem, not because of a gap in knowledge, or our failure to understand a phenomenon, but because the environmental problem describes a phenomenon which we do not like and have judged socially unacceptable. Problems of this kind are not resolved. Rather, they cease to exist when steps are taken to reduce the irritation to socially acceptable levels of tolerance.

I think most would agree that it would be impractical, if not impossible, to totally eliminate pollution; production of waste is a condition of our survival. Though this kind of problem may appear to go away under certain circumstances, it is not ultimately solvable.

Some might argue that one can work to reduce pollution to particular levels or standards. This, however, may be no solution at all. First, consider the arbitrary nature of the standards; there are not absolute values of acceptable pollution. Standards require constant re-evaluation in light of new evidence and argument as various interests advance competing claims. To simply aspire to reduce pollution to some such standard of acceptability would, at best, constitute a partial solution and, at worst, a pseudo-solution. Satisfaction with such results would beg important questions about the appropriateness of the compromise inevitably involved in establishing standards. It should be clear that at the heart of the issue are questions about what is, or should be, socially acceptable. Critical reflection about those values which determine social acceptability is essential to clear thinking about an issue. Perpetuating the "problem solving" myth is antithetical to the notion of such clear thinking. Ethical positions are not static and do not provide concrete solutions; they are constantly being re-examined. re-evaluated and re-defined. Surely this sort of activity is more consistent with the educational enterprise. Unfortunately, concentrating on problem resolution often distracts from these more fundamental issues. Because the ultimate issues are not resolvable in a way which is satisfactory to the scientific mind, pseudo-problems are created.

Pseudo-problems, or problems which are defined without regard to basic questions, allow people to address immediate concerns though underlying difficulties are overlooked or ignored. In reality, proponents are often simply managing the symptoms of a much more complex and difficult issue. This tinkering with symptoms can be likened to applying patches to leaky boats. Immediate treatment of symptoms can be very important, but, the idea that this constitutes problem solving overstates the nature of the accomplishment. As such, it tends to be self-congratulatory, intellectually dishonest and dangerous.

Another concern is about the development of problem solving skills. What is at issue here is the use of the word "skill". Others have argued extensively about the inappropriateness of trying to reduce complex intellectual activities to a set of skills (McPeck, 1981 and Barrow, 1987). I will not attempt to recreate their arguments here. However, given the previous discussion, environmental problem solving, or more correctly, issue investigation, is a complex intellectual activity. Therefore, talk about a discrete set of environmental problem solving skills is facile. Attempts to reduce the study of environmental issues to problem solving exercises and talk of problem solving skills appear to be symptomatic of a much larger problem in the education community. Through attempts to simplify difficult matters for the easy consumption of unwilling clients, we often trivialize them.

Having been critical of one of the institutions of environmental education I confess I have no alternative blueprint. However, I do see directions for inquiry which need more attention. First, our task as educators is not to train students to necessarily solve environmental problems; it is to educate. This is inextricably linked to acquisition of knowledge and understanding, clear and critical thinking and care about the use of reason.

Education will not only help students to understand science, but also the limits of this discipline. We must resist inappropriate attempts to cast complex social issues into the language and methodologies of science; science will not solve many so-called environmental problems. Fundamental to these issues are questions about who we are, our attitudes to non-human components of the environment and what premises will enable us to build a better society. Having argued about our premises, there will be questions about how these should be logically interpreted and implemented in specific instances. It follows that we must prepare students to participate in ethical debate and, heaven forbid, metaphysical discussion. This does not mean that we should abandon the investigation of environmental issues. These preparations can only take place in some context, with content and issues to examine. Critical and intelligent pursuit of current issues should be central to an educator's efforts and will justifiably occupy an important place in environmental education.

While investigation of issues is important, we must be more humble in our aspirations; we must curtail our zeal to solve environmental problems. We must pursue our investigations with passion and encourage passion in our students. But, let us be passionate about pursuit of truth, rightness and humility. Indeed, let us work with humility, that sense of being small, ever diminutive, in a large complex world. Humility does not mean paralysis. We must allow students to think about things which are important to them. They must be able to participate in issue investigation and permitted to act, if they wish, on the best available evidence and argument. However, intellectual integrity dictates that they, too, pursue actions with humility; students will not be solving problems. They will simply be participating as intelligent individuals in the constant re-examination and re-casting of society.

As academics we too must be more humble and introspective. Let us invite discussion, debate and criticism about our foundations and principles. Any suggestion that practitioners accept definitions uncritically is both insulting and arrogant. It is ironic that as educators we attempt to engage students in critical reflection, yet we find an article in an influential international journal which discourages critical scrutiny in environmental education. To oppose discussion about aims and aspirations can only be described as anti-intellectual.

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THE WEST INDIAN MANATEE IN FLORIDA

Marjorie Lamphear
Maitland, Florida

Along with a brief description of this endangered species, including human-related threats to its existence, this presentation will focus on the status of the West Indian manatee with an update on Florida's most recent protection efforts. We will conclude with some ideas on how educators can help.

TROPICAL DEFORESTATION AND GLOBAL CHANGE: WINDOW OF OPPORTUNITY

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Abstract

Global change issues provide a window of opportunity to transform and revolutionize the relationship between nature and humans. This paper provides an update on the broad implications of tropical deforestation and the associated environmental concerns. The complex interrelationships between the temperate and tropical zones will be discussed as well as the need for expanded education programs and responsible action concerning the local-global connection.

Tropical deforestation and associated environmental concerns are threatening the fragile balance of life on Earth. A variety of complex interlocking crises are jeopardizing the ability of growing numbers of humans to meet their basic needs. If life, as it is currently known, is to continue we need to: reevaluate environmental and economic links between tropic and temperate zones; reassess relationships between humanity and the environment; and build a strong sense of awareness and responsible action concerning the local-global connection. Should humanity be willing and able to accept the challenge, global change issues provide a vital window of opportunity to transform and revolutionize the relationship between nature and humans.

Global change issues such as deforestation, species extinctions, human population growth and global warming are being covered in the media, but usually are not dealt with in ways that enhance comprehension or motivate action.

Increasing the amount of information to the general public is not a substitute for sound educational initiatives that focus on changing behavior. Changing the behaviors of individuals, institutions, industries and governments is necessary to deal with this unprecedented rate of destructive global change.

Recent national polls (Harris, 1989) in the United States suggest that the environment has become a potent political issue. Science and natural history museums, local, state and federal governmental agencies, educational institutions and non-governmental organizations must provide leadership in educating the public to make informed decisions. Additionally, these institutions must demonstrate local connections to global environmental problems and explain mitigation strategies. This brief paper is intended to highlight the principal factors causing deforestation, and to explore the broader implications of tropical deforestation to human life and the future sustainability of planet Earth.

Two underlying factors emerging in the scientific and public policy literature that are both causes and effects of tropical deforestation:

1. Exponential growth of the human population; and
2. Unequal distribution of wealth.

Since the 1950s the global population has doubled. Currently there are about 5.3 billion people on the planet. Another billion will be added by the turn of the century, and, according to United Nations predictions, the population will stabilize between 8 and 14 billion by the middle of the next century. It is critical to note that three billion of the world's five billion people are just beginning to enter their most fertile reproductive years (Lamm, 1990). As the human population continues to increase, the natural resource base will decrease. Citizens of the Earth must not only become more aware of the declining natural resource base, but understand how these limited and decreasing resources relate to growing numbers of people.

An ever expanding disparity in the global distribution of wealth contributes to and accelerates the spiral of environmental deterioration. Today, 20 percent of the world's people, living primarily in industrialized nations, consume about 80 percent of the world's resources (WCED, 1987). This disparity in wealth limits the alternatives of the 2.7 billion people from tropical areas living in absolute poverty. Those in poverty have no alternative but to clear the land for daily survival. The cycle evolves in such a way that impoverished people create impoverished environments and, in turn, impoverished environments create impoverished people.

This deadly cycle will soon be, if it is not already, out of control. According to the Worldwatch Institute, one hectare is reforested for every ten that are cleared in the tropics. In Africa, one hectare is reforested for every 29 that are being cleared (Postel and Heise, 1988). The severe poverty in the tropics and the insatiable greed of the developed world are creating a situation where, according to Peter Raven of the Missouri Botanical Garden, the tropical rain forests, particularly the moist lowland forests, will be completely gone within 20 or 30 years (Knipe, 1989).

The current rate of deforestation is no less than catastrophic for the Earth's fragile balance. Simply stated, tropical forests moderate watershed effects (such as flooding), protect topsoil, provide habitat for more than half of the Earth's plant and animal species, provide society with valuable genetic resources, regulate climate both regionally and globally, and provide a sink for atmospheric carbon dioxide. These ecosystem services, or life support systems, secure the ability of all species, including humans, to adapt to changing environmental conditions. Additionally, these ecosystem services provide humans with numerous crops, medicines and other genetic resources that define their quality of life. For example, more than 70 percent of the 3,000 plant species in the world known to contain anti-cancer properties are found in tropical rain forests (Myers, 1983). More than 25 percent of all prescription drugs have their origins in tropical rain forests (Myers, 1984).

The present destructive attitudes and behaviors of human species reflect an anthropocentric and narrow view of the world that places existing civilizations in an Environmental Dark Age. A renaissance of thought and deed is needed to transform the relationship between humans and the Earth--a revolution similar to that in the times of Copernicus. Copernicus taught us that the Earth is not the center of the universe. We must now realize that the human species is not the center of the Earth. Ruckelshaus (1989) further suggests that "Such a move would be a modification of society comparable in scale to only two other changes: the Agricultural Revolution of the late Neolithic and the Industrial Revolution of the past two centuries."

Perhaps the most tragic implication of rain forest destruction is the associated loss of biological diversity. Although extinction is a natural process, the rate of extinction and the human activities and conditions causing the extinctions are of grave concern. The World Commission on Environment and Development has noted that more land has been cleared for settled cultivation in the past 100 years than in all previous centuries of human existence (WCED, 1987). The conversion of tropical rain forests is the leading cause of the unprecedented rate of human-induced extinction.

Many people, for a variety of reasons, think that the current habitat destruction and associated species extinctions are normal. But today the extinction rate is hundreds -- and perhaps thousands -- of times higher, than natural extinction rates (Ehrlich and Ehrlich, 1981; WCED, 1987). Humans have already eliminated approximately one half of the rain forests to the point where only 3.5 million square miles remain, an area less than the size of the continental United States. Over 43,000 square miles are currently being destroyed each year, an area about the size of Pennsylvania (Pasca, 1988) If this destruction continues unabated between 5 and 15 percent of the world's species will become extinct in the next thirty years (Reid and Miller, 1989). We must quickly and thoroughly develop and sustain effective education programs and policies to slow the unparalleled destruction underway.

If current patterns of thought and practice are not changed, global temperatures can be expected to rise anywhere between 3 to 5 degrees C by 2030 (Abrahamson, 1989). It is generally accepted that this devastating global warming is primarily caused by the combustion of fossil fuels and certain industrial processes. However, it is not widely known that approximately 25 percent of the CO2 build up in the atmosphere can be attributed to the burning of the tropics (Houghton, 1987). Carbon dioxide, not previously thought to be a pollutant, is responsible for at least half of the global human-induced greenhouse effect (Cicerone, 1989).

Shifting climate zones, changes in vegetation zones, alterations of precipitation and drought patterns, the detrimental impact on some wildlife species, and rising sea levels as a result of global warming will force societies to more accurately assess their actions. If societies choose not to take responsible preventative action, options will narrow and life will become an endless strand of disorganized responses attempting to cope with a rapidly changing planet.

A realization is evolving that people of the northern temperate zones are connected to the Earth and all its inhabitants in complex ways. Human survival is inextricably tied to a healthy planet and to productive, sustainable development. Recently, former Colorado Governor Richard Lamm expressed a similar sentiment when he said, "Saying that we don't care about what is happening in the Third World is like saying, 'Your end of the boat is sinking (Lamm, 1990).'"

Biological evidence is showing us with great clarity that all life on our small fragile planet is connected. Deforestation, global warming, species extinctions and human population growth are just a few of the threats eating away at our natural resources. Sound, broadly based educational initiatives and the transformation of thought and attitude can change behaviors, revolutionizing humanity and securing a sustainable future in the context of global change. A window of opportunity is at hand. How well individuals and societies take advantage of this opportunity will decide future options.

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EARTH, ANIMALS AND SURVIVAL

William R. Meade, III
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This presentation examines the interconnectedness of all life and our current attitude of lack of reverence for life as the driving force behind most ecological crises. It documents that our animal-based agriculture is the leading cause of deforestation, topsoil erosion, water depletion and pollution, and contributor to the greenhouse effect.

THE GYPSY MOTH IN THE CLASSROOM: A SCHOOL-BASED APPROACH TO GYPSY MOTH EDUCATION

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Abstract

The gypsy moth continues to spread across the United States. In 1990, Pennsylvania alone expects 2.5 million acres of defoliation.

The Gypsy Moth in the Classroom is a school-based education project that involves rearing gypsy moths in classrooms to teach students, and their parents, about the gypsy moth, how it interacts with its environment, and how people can deal with them.

The gypsy moth is one of the most despised and persecuted insects in America. Federal, state and local governments have spent millions of dollars and sprayed tons of dubious chemicals against them. Yet the gypsy moth continues to spread and prosper. What was once a problem of the Northeast is rapidly becoming a national problem. There is every reason to believe that sometime in the future gypsy moths will be found all across the United States, wherever there is hardwood forest.

Activity is on the increase. For instance in 1989, New Jersey reported a nineteen-fold increase in the number of acres defoliated, while Pennsylvania in 1990 is expected a record breaking year for defoliation: 2.5+ million acres. In 1989, Iowa had more detections of gypsy moth than ever, while in 1990, Utah anticipates spraying 20,064 acres in three counties near Salt Lake City. The need for education about this problem seems obvious.

The "Gypsy Moth in the Classroom" project is a school-based program designed especially for elementary and middle school grades. The project was developed in 1988-89 with a grant from the USDA Forest Service, Northeastern Area, State and Private Forestry, Radnor, Pennsylvania. The project was done in cooperation with the New Jersey Department of Agriculture, the New Jersey Division of Parks and Forestry, and the West Deptford Township Schools, West Deptford, New Jersey.

This project is unique in that elementary students and their teachers actually rear gypsy moths in their classrooms, from eggs to adults. The gypsy moths are reared from mid-March to mid-May using an artificial diet.

During this time, students participate in a series of activities designed to teach them and their parents about the gypsy moth, including how they can work to control them, and other lessons about the environment.

The project was "field-tested" in the Green-Fields Elementary School, Woodbury, New Jersey, in the Spring of 1989. Participants included five elementary teachers and their classes. The final product of the pilot program was a curriculum guide for elementary teachers, first released in August, 1989. The guide includes sections on the history and life cycle of the gypsy moth, classroom rearing techniques and a series of classroom activities complete with reproducible student worksheets. The project is easy to start, easy to run, inexpensive, and requires minimal space in classrooms.

People who hear about the project for the first time usually say, "Surely there are enough gypsy moths out there already. Why do you want children to raise even more? What if the caterpillars escape?" There are several responses to this question.

First, the project does not create more gypsy moths. The project begins in late winter with teachers finding an egg mass outdoors and bringing it into the classroom. The egg mass would have hatched anyway. It may as well hatch in the classroom where it can do some good. In fact, anywhere in the United States where egg masses can naturally be found, it makes sense to encourage teachers to raise them in the classroom as an aid to education.

Where gypsy moths cannot be found locally, we do not recommend that teachers send to other locales or states to get them. This would be foolish and illegal: there are quarantine regulations that prohibit transfer of live gypsy moth material outside the generally infested Northeastern states and Michigan. Nevertheless it is possible to do the project in states outside the quarantine area. This can be done by using some of the activities in the project that do not require raising live gypsy moths or better yet by raising live tent caterpillars as a substitute. Tent caterpillars are found across the United States and are often confused with gypsy moth caterpillars. A section on rearing tent caterpillars as a substitute for gypsy moths is included in the teacher guide.

When live gypsy moths are reared in the classroom, due to the timing of the rearing project, from mid-March to about mid-May, escapes are not a problem. Caterpillars that escape in March and April do not have foliage to feed on and will starve. Adult males that escape in May cannot find wild females to mate with are drawn back to the classroom by the lure of the captive females.

In fact, it is the timing of the project that gives it immediate relevance and significance to students. Just when the project concludes in May, wild gypsy moths are becoming a visible nuisance outdoors.

Another question often asked is, "Why not raise them in high school classes, instead of elementary school classes?" The project was developed in elementary grades for a number of reasons.

Unlike teenagers and adults, young children are less likely to have "hardened" attitudes about "bugs and other crawly things." Elementary school children are curious about insects, take an interest in them, and are less likely to find them offensive.

Elementary school students are also more enthusiastic about school in general and science in particular, than older students. Younger students are much more likely to go home and talk to their parents about school activities. Since it is a goal of the project to educate parents as well as students, this is an important consideration.

Elementary teachers typically have few science resources and materials to work with, and almost no budget for obtaining them. yet many elementary teachers like doing science with their students because they know that their students enjoy science activities. As a result, successful elementary school science programs need to be inexpensive. Most materials in the gypsy moth project can be begged, borrowed, or substituted for, while ten dollars of artificial diet will raise a small army of caterpillars.

Adding gypsy moths to a classroom should not be viewed as an attempt to replace part of the science curriculum. Gypsy moths can be used to illustrate many topics that elementary teachers already teach, such as insects, food chains, animal populations, and so on. Rearing caterpillars provides students with an interesting activity, in the same way that teachers often have gerbils or other small animals in a classroom. Teachers can spend as little or as much time on the project as time permits.

The Gypsy Moth in the Classroom project was expanded in 1990 with funding from a second grant. A major focus of the grant was an aggressive effort to get the project into the hands of teachers and educators who will use it. This effort included workshops and presentations at local, state, regional, and national levels. Accessory materials including a board game and videotape have been developed.

An attempt will be made to quantify the educational benefits of the program to parents. Many societal problems cannot wait ten years for students to grow up and become adults. Traditional parent/student partnership programs have focused on using parents to further the education of their children. Seldom has a partnership program worked the other way, using students and their school activities to educate parents. The study may reveal the extent to which students and schools, through a reversal of the parent-child partnership, can make an immediate contribution to the solution of a social and environmental problem.

The final word on "The Gypsy Moth in the Classroom" should be given to those who have seen or used the project. Their reaction has been overwhelmingly enthusiastic: "outstanding quality and professional execution" (Northeastern Area Association of State Foresters), "truly an inspiration to those of us involved in gypsy moth education" (Nancy Campbell, Michigan District Extension Leader), "the best resource on the gypsy moth I've seen in twenty years as an agricultural agent" (Ed Milewski, New Jersey Agricultural Agent, "the teachers are excited and motivated" (Susie Oliphant, Washington, D.C., Director of Curriculum for Science), "informative, interesting, accurate, and well-balanced" (Bill Wentzel, Forestor for Washington County, PA), "extremely well presented, organized and understandable" (Harold Kuschnik, Ganaraska Region Conservation Authority, Ontario, Canada), "innovative and presented with considerable imagination" (Alan Cameron, Professor, Penn State University), "the multidisciplinary format allows it to be used by many different teachers" (John Neville, Environmental Educational Supervisor, Prince Georges County Schools, Maryland), "congratulations on a job well done" (Bill Hatfield, Hatfield Spraying Service, Nunica, Michigan).

Curriculum guides (free) and other materials are currently available from Erik Mollenhauer, Project Director.

THE VICIOUS CIRCLE MEETS GAIA

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Abstract

When social and environmental problems are addressed separately, a "vicious circle" results and problems worsen rather than improve. Traditional education may help perpetuate this condition because of its limited scope. This paper discusses ways that Gaia (living planet) theory and myth speak to attempts at breaking the vicious circle.

In previous papers, I have discussed the "vicious circle" resulting from independent attempts to address environmental, social and religious problems (Ogle 1988 and 1989). Modern-day problems including pollution, drug abuse, poverty and habitat loss worsen despite the best efforts of committed and able people because of our fragmented way of dealing with them. To escape from this vicious circle, we need a framework to guide us--what some people might call "a myth to live by." The Gaia theory of James Lovelock, named after the Earth Goddess of ancient Greek mythology, has the potential to be such a guiding principle. This paper introduces some ways in which Gaia theory and myth (simply, "Gaia") speak to the vicious circle phenomenon.

In both Gaia theory and myth, the Earth, as a whole, is seen as a living being. Rather than simply being a suitable place for life to occur, our planet is a dynamic, self-regulating system in which the various parts (atmosphere, organism, oceans, etc.) work together. For a thorough understanding of Gaia, one should refer to several books on the subject (Lovelock 1979; Lovelock 1988; Allaby 1989; Sahtouris 1989; Joseph 1990). A brief overview is provided here.

The Gaia theory was developed in the 1960s by James Lovelock, an English scientist. At that time, Lovelock was commissioned by the National Aeronautic and Space Administration to determine whether life existed on Mars. Lovelock first had to decide how to recognize life in general; an alien form might not look or "act" like anything on Earth. He chose to do so not in conventional, biological terms, but instead took physicist Erwin Schrodinger's view that "life is the paradoxical contradiction to the second law (of thermodynamics) which states that everything is...running down towards equilibrium" (Lovelock 1988). Like a sandcastle on an otherwise wave-smoothed beach, a condition that defied the overriding tendency toward equilibrium would indicate life. Lovelock's first clue as to Mars' lifelessness was its atmosphere. The high levels of CO_2 and low levels of N_2 and O_2 (Table 1) are what one would expect if elements on Mars were allowed to react freely and reach equilibrium. Earth's atmosphere, however, is far from equilibrium--high in O_2 and N_2, but low in CO_2--and this condition is precisely maintained over time. To Lovelock, this planetary contradiction to entropy strongly suggested that our entire Earth is alive. He has also found self-regulation of ocean salinity, surface temperatures and other factors. The work of microbiologist Lynn Margulis and others has also support the Gaia theory.

1) A Vicious Circle Within Gaia--People on Daisyworld.

How then, does Gaia speak to the vicious circle of modern society? For starters, Gaia is the antithesis of a vicious circle. A living planet is the ultimate example of negative feedback (Figure 1), while a vicious circle is the very unstable result of positive feedback (Figure 2). Gaia thus offers us a stable model to pattern our lives after.

A physician knows well the necessity for negative feedback within a human body. When the body becomes "fragmented" and its parts do not communicate or interact properly, it sickens and dies. Unfortunately, we rarely recognize that systems larger than individual organisms (i.e., societies, Earth) operate by negative feedback as well. The Gaia story widens our perspective of what constitutes a living system and causes us to view these systems holistically--as a doctor sees a body. If we see the Earth as alive, we must take care not to cause it parts to lose contact or interact properly. Practically speaking, this means that we should promote meaningful interaction between various segments of our society and also make our society an integrated part of Gaia.

Some Gaia critics have charged that for Earth to be alive, there would have to be a guiding force or ability of the system to "look into the future." Lovelock has dispelled this criticism with his mathematical models of "daisyworld" which show the possibility for planetary-scale regulation of conditions by automatic negative feedback (Lovelock 1988). The models depict the automatic regulation of surface temperatures on a hypothetical planet through the relative abundance of dark and light daisies which absorb sunlight differentially. Even if this planet's sun became progressively hotter (as our sun is indeed doing), temperatures would stay constant because of changing proportions of dark and light daisies.

Ironically, human consciousness gives us the unique, yet unnecessary ability to see (somewhat) into the future. The negative feedback mechanisms of Earth which used to be automatic (like on daisyworld), are increasingly affected by purposeful, conscious decisions made by human inhabitants. Some would argue that Gaia's ability to survive transcends human tinkering. Whether or not this is true, if human beings are to improve our lot within Gaia, we will have to learn from it and make a conscious return to its ways.

2) Origins of our Departure--Artificial Boundaries.

How did human society lapse into a vicious circle in the first place? Although the exact answer is buried in the distant past, it can be speculated that our departure is an artifact of human consciousness. While thoughtfully analyzing their world, some ancient peoples started to superimpose artificial boundaries on Gaia. Although these divisions were useful in some ways, with time they became embraced as truths in their own right. Elisabet Sahtouris (1989) has highlighted an example of this artificial breakdown which fundamentally changed Western views of life. She notes that in ancient Greece, all nature (or "physis") was considered to be alive. (A physicist, therefore, studied nature). Later, people began to distinguish between living and non-living things and pysicists studied inanimate phenomena while biologists (from "bios" = "way of life") studied the animate. While this split is convenient for study purposes, it may have impaired our ability to sense the unity of our planet's life, thus allowing for our aberrant behavior. Further splits between science and religion (and myth), male and female, and other "wholes" have made people suspicious of each other and overly competitive. The Gaia story, by providing a context within which to view artificial divisions, can help us re-integrate the efforts of people from diverse walks of life.

3) Social Darwinism to Social Gaianism--A Society Matures.

Positive feedback is not only unstable, it tends to perpetuate itself until the system breaks down because the return path to negative feedback is obscured. For instance, as a hypothermia victim becomes dangerously colder, he/she also becomes less aware of the problem and less able to seek help. One could argue that in Western society, the notion of "Social Darwinism" strengthens our vicious circle and makes it harder to see a release. With competition as the most important guiding force, components of our economy withdraw from each other and create barriers to meaningful interaction (i.e., beyond what is encouraged by the profit motive). Although competition is doubtless a part of Gaia, it is only one part. Social Darwinism's fault is its incompleteness--for competition only makes sense within the larger context of cooperation.

Lynn Margulis' extensive, and once controversial, research on the evolution of microorganisms to multicellular life contrasts sharply with classic Darwinism. She was among the first to propose that mitochondria and chloroplast of multicellular organisms are results of cooperative evolution early in the history of our planet's life. Margulis argues that mitochondria and chloroplast were originally bacteria which upon being engulfed by or parasitizing larger bacteria worked together with their hosts to the benefit of both. This union allowed for the development of larger cells and then multicellular life (another cooperative venture). Margulis' ideas now command the respect and attention of the scientific community.

> "We consider naive the early Darwinian view of 'nature red in tooth and claw.' Now we see ourselves as products of cellular interaction... Partnerships between cells once foreign and even enemies to each other are at the very roots of our being." (Margulis, 1987).

Cooperation is fundamental to Gaia. Not only are organisms essentially "partnerships between cells," free-living microbes (i.e., bacteria, blue-green algae) are indispensable as recyclers and as regulators of atmospheric gasses and ocean salinity, and as such maintain our planet's life. "Social Gaianism," then might be a fitting substitute for "Social Darwinism" as we attempt to recognize and break out of the vicious circle. Elisabet Sahtouris sees this transition as the maturing of an "adolescent society."

> "Like an adolescent in trouble, we have tended to let our focus on the crisis itself or on our frantic search for particular (emphasis added) political, economic, scientific, or spiritual solutions depress us and blind us to the larger picture, to avenues of real assistance. If we humbly seek help instead from the nature that spawned us, we will find biological clues to solving all our biggest problems at once. We will see how to make the healthy transition to maturity." (Sahtouris 1989).

The particular solutions Sahtouris speaks of can be useful, but they must be used *together* within a larger context.

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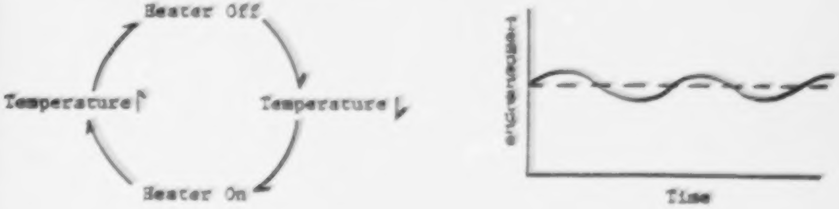
Table 1. Characteristics of the atmospheres on Mars, Venus, and Earth. (After Lovelock, 1979).

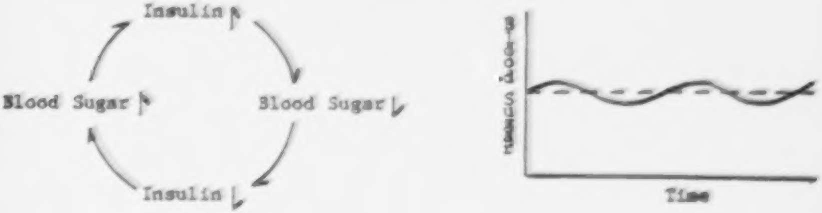
GAS	PLANET			
	Mars	Venus	Earth (without life)	Earth (as it is)
Carbon dioxide	95%	98%	98%	0.03%
Nitrogen	2.7%	1.9%	1.9%	79%
Oxygen	0.13%	trace	trace	21%
Surface Temp. (°C)	-53	477	290±50	13

Figure 1. Examples of negative feedback loops ("friendly circles").

A. Thermostatically controlled temperature regime


Heater Off
Temperature ↑
Temperature ↓
Heater On
Temperature
Time

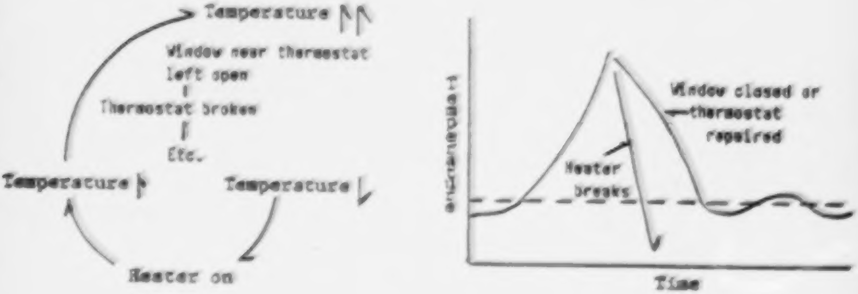
B. Physiologically controlled blood sugar regime


Insulin ↑
Blood Sugar ↑
Blood Sugar ↓
Insulin ↓
Blood Sugar
Time

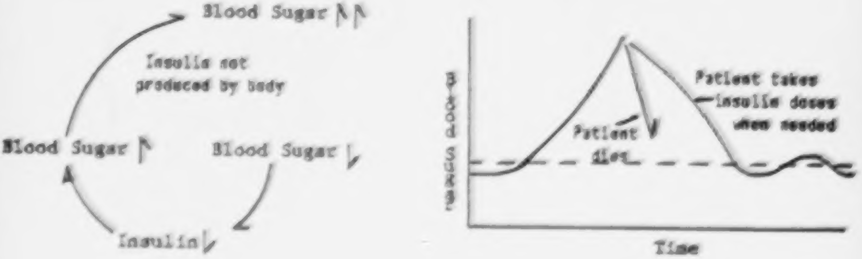
Gaia (the living planet) is the ultimate example of negative feedback. Countless billions of factors, including those at the planetary scale (i.e., atmospheric composition, ocean salinity, etc) are maintained within precise limits by negative feedback.

Figure 2. Examples of positive feedback loops ("vicious circles").

A. Problems with a thermostatically controlled temperature regime


Temperature ↑↑
Window near thermostat left open
Thermostat broken
Etc.
Temperature ↑
Temperature ↓
Heater on
Temperature
Window closed or thermostat repaired
Heater breaks
Time

B. Problems with a pysiologically controlled blood sugar regime


Blood Sugar ↑↑
Insulin not produced by body
Blood Sugar ↑
Blood Sugar ↓
Insulin ↓
Blood Sugar
Patient takes insulin doses when needed
Patient dies
Time

Positive feedback (a vicious circle) is an aberration from the normal, healthy functioning of a system, and cannot continue long before the subsystem in which it is exhibited breaks down.

BUILDING A NETWORK FOR ENVIRONMENTAL EDUCATION

John R. Paulk
Steven C. Kussmann
Alliance for Environmental Education
Arlington, Virginia

The Alliance for Environmental Education is an organization that is building a Network for Environmental Education. Now, in partnership with the United States Environmental Protection Agency, the Alliance for Environmental Education is establishing a network of interactive environmental education centers across America. The historic public/private partnership could permanently transform the way the world thinks about the environment.

UNDERSTANDING THE ENVIRONMENTAL IMPLICATIONS OF AGRARIAN TRANSFORMATION, A STUDY OF MEXICO, 1934-1954

John H. Perkins, PHD
The Evergreen State College
Olympia, Washington

Mexico developed an industrial base and modern agriculture in the 1940s and 1950s. The Rockefeller foundation helped Mexico develop modern agriculture, because, it argued, Mexico was short of food. In reality, Mexican leaders wanted higher wheat production in order to support development of an urban industrial economy. Environmental educators must be aware of the complexities that lay behind this transformation from a peasant, agrarian society to an industrial state.

PANEL DISCUSSION:
USING THE THEORY OF POLITICAL ECOLOGY

John H. Perkins, Panel Chair
The Evergreen State College
Olympia, Washington

Educating about environmental issues and policies Political Ecology is a theoretical framework that helps understand how social and natural systems interact. Faculty and master's students at The Evergreen State College use the approach in their research. This panel features four papers in which political ecology was the framework used to conduct the study.

IS IT TIME TO ADD ENVIRONMENTAL LAW TO ENVIRONMENTAL STUDIES

Zygmunt Plater
Boston College Law School
Boston, Massachusetts

The missing link in many environmental studies curricula is a systematic course in environmental law and how the various elements of the legal system handle the scientific and policy perceptions of modern environmental analysis. Ongoing trial and development of such a course illustrates the perils and benefits of demystifying environmental law.

UNIVERSITY OF CALIFORNIA EXTENSION HAZARDOUS AND TOXIC SUBSTANCES PROGRAM: SERVING THE NEEDS OF THE PROFESSIONAL COMMUNITY

Janice L. Pratte
University of California at Irvine
Irvine, California

There is a strong demand for professional education concerning hazardous and toxic substances, especially in economic growth areas. A program has begun to meet this demand through seminars and courses leading to a Certificate in Hazardous Materials Management. Cooperative programming with local and state agencies and curriculum design with input from leading representatives of the prospective, professional students suggest a model for successful educational opportunities in other states.

LEADERSHIP IN THE 1990s: THE NATURE OF ENVIRONMENTAL EDUCATION

P. J. Puntenney
Ann Arbor, Michigan

A new environmental leadership emerged in the '80s redefining participation and cooperation. It also brought about major changes in the way policy communities think about environmental considerations. Through a community vision "In the year 2000, ____ will...", an effect is well underway to bring about natural resource protection. At the heart of the project is EE providing a framework for cooperation.

RASPUTIN'S BAIKAL; BAIKAL'S RASPUTIN

Thomas B. Rainey, PHD
The Evergreen State College
Olympia, Washington

Industrial pollution threatens Lake Baikal, a Siberian inland sea of great purity and beauty. For twenty years Siberian writers, especially Valentine Rasputin, have warned Soviet citizens of the dangers to the lake. Rasputing has written numerous books, essays and short stories about threats to Lake Baikal and its environs. Photographic slides, a brief video tape and readings from Rasputin's works will illustrate the power of his message.

HIRING PRACTICES OF AN AIR QUALITY CONSULTING FIRM

Richard H. Schulze
Trinity Consultants, Inc.
Dallas, Texas

Trinity Consultants, Inc. recruits across the nation. Candidates have little relevant experience and only a smattering of course work that directly relates to our business. We therefore, provide extensive training through formal courses in dispersion modeling and air quality regulations. Because this information is not well covered in engineering and environmental programs, we make it available to the public as short-courses. Training is supplemented by regular "brown bag" lunches where one of the staff makes a presentation of special knowledge he or she has developed.

THE U.S./CANADA ENVIRONMENTAL RELATIONSHIP AFTER ACID RAIN

Alan M. Schwartz
St. Lawrence University
Canton, New York

Over the last decade, the cloud of acid rain has been so dominant over the U.S./Canada environmental relationship that other important items have been all but obscured. This paper will review the major environmental agenda between the U.S. and Canada after both countries sign an acid rain accord. The focus of the talk will be the efforts and controversies surrounding the clean-up of the Great Lakes. Small, but locally important, irritants along the entire border will be reviewed.

SEEKING SUBSTANCE IN SUSTAINABLE DEVELOPMENT

D. Scott Slocumbe
Caroline Van Bers
University of Waterloo
Waterloo, Ontario, Canada

This interactive workshop will assist the participants to move beyond the concept of sustainable development to think and teach about a sustainable society. Building on a brief overview of sustainable development's history and theory, we will explore necessary changes for sustainability. Identification of links, trade-offs, and structural incompatibilities, will be emphasized through many examples.

PUBLIC FOCUS PROGRAMS--AN OVERVIEW

Steve Smith
Julie Whitfield
Tom Green
Public Focus
Toronto, Ontario, Canada

Public Focus, through programs such as the Children's Environmental Festival, the Backyard Acid Rain Kit (BARK), Visions 2020, Environmental Outreach, and an Environmental Resource Directory, has spent over a decade carrying out challenging interactive projects for students of all ages. This session will highlight our approaches, successes and future directions.

RECYCLING EDUCATION: WISCONSIN AND BEYOND

Joel Stone
Wisconsin Department of Natural Resources
Madison, Wisconsin

Abstract

Wisconsin's recycling education program is directed at the youth of Wisconsin--encouraging them to take action. It has three target audiences: participants in schools, park interpretive programs, and 4-H clubs. Participants in this session will be introduced to the program through demonstrations, activities and discussion. Educational materials will be distributed and ways to implement recycling education on a statewide basis will be discussed.

As educators we recognize that waste reduction through recycling will only be accomplished through individual as well as institutional actions and that the best way to affect individual behavior is by educating our youth. The Wisconsin Department of Natural Resources (DNR) and Region 5 of the Environmental Protection Agency (EPA) worked together to produce recycling education materials and examined ways to efficiently and effectively distribute these materials to teachers and youth leaders. Emphasis was placed on establishing cooperative networks for the development and distribution of program materials. Materials developed and tested in Wisconsin were applicable and made available for use nation-wide.

This recycling education program was directed at the youth of Wisconsin--encouraging them to take action. The 1990 program had three target audiences: schools, participants in park interpretive programs and 4-H clubs.

School Program

The Wisconsin DNR's nationally recognized Recycling Study Guide for grades 4-12 was used as the foundation for the school program. The Fourth "R": An Action Booklet for Recycling in the Classroom and School and a K-3 supplement for the Recycling Study Guide were developed. High school activities with a Science Technology and Society theme are in the final stages of development.

Park Interpretive Program

The Wisconsin state park interpretive program selects an interpretive theme each year. Recycling, with an emphasis on nature's recyclers, was chosen as the interpretive theme for 1990. Interpretive posters ("Life from Death--Recycling", "Composting--a Natural Experience", "We're Recycling Now" and "Is Your Picnic Going To Waste?"), activities for the **Wisconsin Explorer** (a parent-child participation program), an activity booklet (*Nature's Recyclers Activity Guide*), a coloring book (*Natures's Recyclers*) and a slide/tape program ("Nature's Recyclers") were developed for the program. State parks were also encouraged to provide recycling containers for park visitors and to set up composting demonstrations.

4-H Program

The Wisconsin 4-H program's *Recycle for Reuse: leader-member-family guide* was supplemented with an incentive program called **Recycling the 4-H Way**. This program was sponsored by the Wisconsin DNR, University of Wisconsin Cooperative Extension 4-H Program and Wisconsin Industries . Saving the Environment. **Recycling the 4-H Way** encourages 4-H'ers to participate in a variety of recycling activities (recycling week, community service projects, club recycling and county fair exhibits) each year by giving annual awards to top participating clubs.

Development and Distribution of Materials

Product distribution is just as important as product development. Unfortunately in many programs, so much time and energy is devoted to development that there is little left for distribution. Even the best educational materials are useless if teachers and adult leaders do not know about them and use them. Consequently, a great deal of time in this program was devoted to investigating potential mechanisms for product distribution and setting up the proper networks. This was done before new program materials were developed. Once the target audiences and their corresponding networks were selected, members of each network were provided the opportunity to assist with the development of materials. This gave key participants ownership of the programs and resulted in the creation of program materials that were most likely to be used.

Subject specific curriculum consultants in Wisconsin's Department of Public Instruction (DPI) assisted in the development of the school programs and provided access to the various teacher associations. The newsletters and conferences of these associations were used initially to solicit program ideas, and after materials were developed, they were used respectively to announce and distribute program materials. The Wisconsin DPI has a Cooperative Educational Services Agency (CESA) that has 12 district field offices. The newsletters and services of the CESA offices were also used to announce and distribute program materials. In addition, DNR recycling education program staff responded directly to material requests and conducted recycling education inservices for teachers.

The Interpretive Committee for the DNR's Bureau of Parks and Recreation assisted in the development and distribution of the **Nature's Recyclers** program and in training interpretive naturalists. All superintendents and naturalists in the state parks were provided a synopsis of the proposed program in 1989 and were given an opportunity to critique it as well as to submit additional ideas. Program materials were distributed to participating parks and state forests in the late spring of 1990 and the interpretive naturalists received training in June. In addition, selected materials were sent to public and private nature centers and to members of the Wisconsin Park and Recreation Association.

The Environmental Education Committee for the Wisconsin 4-H organization assisted in the development and distribution of **Recycling the 4-H Way**. The monthly 4-H "Open Line" newsletter was also used to solicit program ideas and to announce the program. Materials were distributed to all 4-H clubs through mailings to county 4-H and youth agents.

National Distribution of Materials

The DNR has already distributed its first printing of the Recycling Study Guide and continues to respond to requests from all states for the second printing. "Copy masters" of this guide were provided to all regional offices of the EPA (except Region 4), and several states have printed their own editions. "Copy masters" of the newly developed materials will be provided to Region 5 of the EPA once each program has been evaluated. At the same time, a set of the school, interpretive and 4-H program materials will be sent to appropriate DNR, DPI and 4-H agencies in all 50 states.

USED OIL RECYCLING CURRICULUM

Randall H. Stovall
Valencia Community College
Orlando, Florida

A curriculum kit addressing conservation in general and used oil management in particular will be presented and demonstrated. Applying a variety of teaching strategies, the kit includes a video, a game, group and lab activities and guides for community involvement, as well as student and teacher resource materials.

SCHLESINGER'S THE CYCLES OF AMERICAN HISTORY
A UNIVERSITY ENVIRONMENTAL STUDIES COURSE

Thomas Tanner
Iowa State University
Ames, Iowa

Abstract

In a senior-level course, the environmental records of recent administrations and Congresses are examined. The proposed paper explains how this information is then set into historical context, with especial references to the 1986 volume named above. Schlesinger's theory is examined for adherence to reality, explanatory power, and predictive power.

The Cycles of American History, 1986, by historian Arthur M. Schlesinger, Jr., finds a significant place in the senior-level environmental issues course at Iowa State University. The course deals with issues and case studies, national and international, current and historic; these include, for instance, the battles of Hetch Hetchy, Echo Park, Glen Canyon, and Tellico dams, DDT, Reagan, Watt, and the Sagebrush Rebellion, the rise and fall of nuclear power, and so on.

Cycles, as explained to the students, helps them to assimilate the American cases into an historical context. Schlesinger, like his father and a number of other historians he cites, posits the existence of cycles in American history, as his title indicates. One may be justifiably cautious about embracing the concept of cycles where there are so many uncontrolled variables as exist in a nation's political, economic, and social behavior. Nevertheless, his argument for cycles of approximately thirty years is a compelling one--first, because of the evidence he produces; second, because of the rather plausible explanations he offers for their existence; third, because of the apparent predictive power of the theory.

As for the evidence, he cites certain decades widely acknowledged as periods of self indulgence and self seeking --the 1890s, 1920s, 1950s, 1980s. Some even have names--the Gay Nineties, Roaring Twenties, and the recent decade of the Me, Now, or Yuppie generation. He argues further that these tend to be followed by periods of social reform, i.e. TR's progressivism, the New Deal, the Great Society, and the promise more recently of "a kinder and gentler nation." Schlesinger uses the terms Private Interest and Public Purpose to characterize these alternating periods. In teaching his idea I cite many examples, e.g. Teddy's trustbusting, events leading to the stock market crash of '29, social security, McCarthyism, civil rights legislation, corporate takeovers.

By way of explanation, Schlesinger offers both a societal and an intriguing generational/human development theory. In the former, he sees each period of Public Purpose as a reaction to the excesses and government corruption of the preceding period. But the energy required for reform cannot be sustained indefinitely, the public relaxes, party time ensues, civic responsibility fades, and the rascals take over Washington. When the public has had its fill of Teapot Domes, Sherman Adams fur coats, Iranscams, and all the accompanying hedonistic excesses both in and out of Washington, the cycle begins again.

The generational/human development explanation holds that one's values become well established in the years of preadolescence and early adolescence. To the degree that these values are not established by family, church, and other factors of the immediate environment, they are influenced by the larger culture as represented on television, radio, magazines, motion pictures, and so on. Lacking historical perspective, the child naturally views that larger environment as normal. Thirty years later, upon attaining the height of its economic and political power, his/her generation returns the nation to its perception of normalcy, be that Private Interest or Public Purpose.

One test of a theory is its predictive power. Working from his earlier version of this theory, Schlesinger's father in 1924 predicted a swing beginning about 1932, and in 1939 another beginning approximately 1947. Growing bold by 1949, he predicted shifts in 1962 and 1978. Surely many social analysts would agree that he got it about right.

The predictive power of Cycles itself is verified by stories which have broken since it was written. First there was the wave of scandalous affairs emanating from the White House (Iranscam/Contragate, Wedtech, DOD procurement, HUD consulting fees), and from the board room, e.g. Boeske, Milliken, the S&Ls. Then came both the outcries against these and the many signs of a major mood swing toward Public Purpose. The mainstream media became increasingly saturated with views of the homeless, drug addicts, AIDS victims, adolescent gangsters, children having children. TIME magazine, long a bastion of Establishment conservatism, began to read like Mother Jones or Rolling Stone. A presidential candidate was elected on promises, at least, to be the Environmental President, the Education President, the leader of a kinder and gentler nation. "Socially responsible" investment funds became Wall Street's most heavily advertised products. The press began, albeit belatedly, to find fault with Ronald Reagan, and every pundit's crystal ball now sees the nineties as a decade of reform. As these words are being written, the upcoming Earth Day is far and away the only show in town, and the press is remarking that while its predecessor was a major dissident event, EDII seems to involve everyone, even corporate America, with no discernible dilution of spirit or purpose. (In fact, analysis of the two Earth Days, using the Schlesinger theory, suggests that the timing of EDII may be more fortunate than that of its predecessor, EDI having occurred when its spirit could not be well sustained by the ensuing period of Private Interest.)

In summary, Cycles does seem to have predictive power.

Having explained these ideas to his students, the writer reviews environmental cases as seen from this perspective, e.g. TR's campaign for national parks and forests, the Teapot Dome scandal, the CCC and TVA, the Interior Secretary known as Give Away McKay, the Wilderness Act, and especially the many examples of the Reagan decade, from the EPA scandals to corporate takeovers in the timber industry, from James Watt to the Exxon Valdez, all arguably attributable to the spirit of Private Interest and an administration wholeheartedly dedicated to that idea.

Given all of the above, this portion of the course concludes, quite logically, on a note of optimism about the 1990s. (But beware the Wild Tens!)

MARINE CONSERVATION ISSUES IN HAWAII

Dr. Teny Topalian
California State University
Long Beach, California

This presentation will examine marine conservation and education needs in the Hawaiian Islands. The emphasis will be on preservation of coral reefs, with a discussion of resource management and policy issues.

JOHNNY BIOSPHERE, PHD

J. R. Vallentyne
Department of Fisheries and Oceans
Burlington, Ontario, Canada

Johnny Biosphere travels around the world in a safari suit with a globe on his back planting seeds of ecological wisdom in the minds of children. The development and impact of this real-life character are illustrated through re-enactment of major transformations from 1980 to 1990.

EARTHWATCH KANGAROO AND LEATHERBACK TURTLE EXPEDITIONS

Jim Weber
San Antonio, Texas

Journey with a high school biology teacher and two of his students to Fowlers Gap, Australia and St. Croix, Virgin Islands as they participate in Earthwatch expeditions. Observe slides of their research with kangaroos and Leatherback turtles. Learn how their acquired knowledge is used to motivate students in the classroom and teach them about environmental issues.

STRAND III: Curriculum & Teaching Strategies

THE ENVIRONMENTAL IMPACT AND THE TEACHING AT PROFESSIONAL LEVEL

Patricia Andrade S
Eduardo Vadillo Sanchez
Leonardo Meza
Mexico City, Mexico

The changes that occur in Mexico's law about ecology, has made necessary the training of highly efficient professionals qualified to carry out Environmental Impact Studies. Incorporating an integrated ecological vision within university studies is necessary. The object of this work is to know the real conditions about the professionals and their conception of the environmental problems.

A SUGGESTION FOR TO APPLY A PROGRAM FOR ENVIRONMENTAL EDUCATION DIRECTED TO BUSINESSMEN AND POLITICIANS

Patricia Andrade S
Eduardo Vadillo Sanchez
Leonardo Mexa
Mexico City, Mexico

At the present time, solving environmental problems involves the work of the whole society. Besides environmental education for children, it is necessary to introduce courses for businessman, politicians and so forth who make descisions about these problems. The object of this work is to introduce the basic ideas for the application in Mexico.

A NEW WAVE: STRATEGIES FOR MARINE EDUCATION

Polly M. Andrews
Sea World of Texas
San Antonio, Texas

Abstract

The marine ecosystem is a conglomerate of various habitats. Hands-on techniques utilizing all senses must be implemented to maintain high levels of interest among students.

This in-depth session will provide teachers with numerous techniques. Animal visual aids, saltwater experiments, habitat simulation and hands-on activities will be provided. These activities may be adapted into any environmental study.

There can be no doubt that the health of the world's oceans is vital to the health of our entire planet. Earth's nickname os "water planet", accurately describes a planet's surface that is more than 70 percent ocean. The oceans have a major influence on global weather patterns, affecting coastal residents as well as inland inhabitants. The food harvested from Earth's oceans provides the primary nutritional source for millions of its inhabitants. The fate of these millions is dependent upon successful management of the ocean's fish, shellfish and marine plant resources. Mineral deposits found in and under the seas have been a valuable energy resource, and continued research in the possibility of using tides, waves and marine plants as renewable energy resources is in progress. Scientists have found the oceans to contain a variety of pharmaceuticals obtained from marine algae, bacteria, fish and other sea life, and they continue to research many sea organism's potential as future medicines. As we increase our uses of the earth's oceans we also increase our potential of harming them. A greater awareness of the global importance of healthy oceans is needed to ensure their heartiness. Marine education is the first step in creating an awareness of the oceans and should be taught in all coastal as well as inland environments.

An introduction into the study of the sea should begin with water itself. Ocean water has a different composition than the freshwater found inland lakes, rivers and streams. The main difference is the large amounts of minerals that are dissolved in ocean water. Principle among these minerals is common table salt (NaCl), therefore ocean water is commonly referred to as "salt water". Saltwater has different physical properties than freshwater. It is more dense because of the salt. This can be illustrated using homemade, colored saltwater and mixing it with freshwater. Both should be in separate, equal containers. Place a card over the clear water and slowly invert it on top of the colored water. When the jars are matched remove the card and tape the jars together. Slowly tilt the jars on to their sides and observe the colored water as it sinks to the bottom and the clear water remains on top. Student's should be allowed to taste both types of water to maximize perception. Finally, pour saltwater and freshwater into two separate pie tins and allow them to evaporate. The salt remaining adds visual proof to the fact that saltwater is heavier because of additional minerals. Saltwater is as important to marine life as air is to land inhabitants, its' cleanliness and vitality is imperative to all life below and above the waves.

Many students find it difficult to visualize a deep ocean floor beneath the ocean surface. They are fascinated with the thought that Mount Everest could actually fit inside the deepest ocean trench and still not be seen above the waves. Scientists have mapped the sea floor using sound waves and timing the return of the echo. To help students fisualize the concept of deep ocean trenches and ocean mapping, students can plot simulated ocean bottoms. Simulated bottoms can be constructed from blocks, books, boxes, etc... A paper should be held in front of the "ocean bottom" while a string is drapped behind the paper. When the string hits bottom the students will mark that spot with their finger, pull the string up and from the marked spot hang it in front of the paper. They will then mark the length of the string on the front side of the paper. This continues every inch along the top of the paper. Once finished, connect the dots beginning with number one. The final result is a plot of your "ocean bottom".

The ocean bottom is just one of a multitude of various habitats. The benthic, or bottom, environment is home to many species of animals including rays, sea stars and crabs. Bottom dwellers usually have bodies which are flattened from top to bottom. This particular shape helps with swimming and crawling while remaining close to the cover of the sea floor. The open ocean, or pelagic, environment is home to many floating and free-swimming animals. Floating animals such as zooplankton and jellyfish reach their destinations simply by hitchhiking a ride among the seas currents. Free swimmers in a pelagic environment have torpedo shaped bodies and v-shaped tails to maintain strong fast speeds. Prime examples of pelagic fishes are marlin and tuna. Coral reef fish have yet another body shape adaptation. These fish must maneuver between coral, therefore, they usually have laterally compressed bodies with short fan shaped tails for abrupt darting movements. The coral itself is a small animal which secretes a protective home around its body. The animal is a filter feeder which extends tenticles from its home to capture food particles from the water. Most of the ocean's habitats, from coral reefs to deep ocean bottoms can be simulated in wall murals, papiermache projects and worksheets. Matching animal adaptations to their environment can be obtained by using 3-D animals against the wall mural. The model should depict correct forms of camouflage and body shape. Character plays can be developed to correlate various adaptations with a specific habitat while discussing their functions. Any discussion on the ocean's diverse environments can be exciting and informative as long as instructors use techniques which utilize sight, sound, tough and plenty of student imagination and ingenuity.

Marine education is a mixture of various science related fields. Chemistry, physics, geology and biology can all be taught through discussing saltwater composition, depth and pressure experiments and plant and animal adaptations. Marine science is an important subject, and due to its diversity can be incorporated into any science curriculum. For hundreds of years we have taken our oceans for granted, believing they are so vast that to harm them is impossible. Recent episodes of waste washing to shore and animal injuries have proved that thought to be wrong. Because we all rely on the oceans in one form or another it is everyones responsibility to ensure their health. Educators of all types must take the lead in teaching informative and exciting marine science courses. For the health of the world's oceans, and for the health of the planet itself, effective marine science education is the key.

ORGANIZING COMPLEXITY: USING A SYSTEMS THEORY-BASED MODEL TO HELP STUDENTS UNDERSTAND THE BASIC TIES BETWEEN CULTURE AND ENVIRONMENT

David Backes
University of Wisconsin-Milwaukee
Milwaukee, WI

Abstract

To develop critical thinking about environmental issues, teachers need to discuss the basic "human-mind-land" interrelationships that underlie all environmental issues. This presentation will show how to use systems theory to challenge students' assumptions and to give them an interpretive framework they can use to study any environmental problem.

Students readily grasp the basic idea of systems theory--that society and the environment are continually affecting each other--but have a harder time understanding the basis of this reciprocal relationship, and applying this knowledge in particular situations. This paper describes a schematic model that can help with both parts of the problem.

The model, based on biosocial theory, assumes the basis of the relationship between society and the environment is functional, rather than geographic; the perceptions people have of natural resources, and the behaviors related to these perceptions, link the social system to the ecosystem. This distinguishes biosocial theory from the ecological perspective advocated by such cultural ecologists as Clifford Geertz. The ecological perspective includes society within the geographic boundaries of the ecosystem being studied; it is evident, however, that important government and social organizations affecting a given ecosystem are not always located within that ecosystem's geographic boundaries.

Biosocial theory also counteracts the tendency of cultural ecologists to use mechanical or biological models to explain human behavior, a tendency accentuated by their placing of the social system within the ecosystem. Biosocial theory argues that the ability of people to learn and innovate gives social systems a capacity for structural change that has no direct comparison in biophysical systems.

Discussion of these issues can help students understand how schematic models can help them discover flaws in the basic assumptions of the underlying theories, and the difficulties in applying mechanical and biological theories to human behavior. This will better equip them to apply the model outlined below.

The Biosocial Boundaries Model

I developed the biosocial boundaries model to illustrate and apply biosocial theory. Three concepts are central: environmental, perceptual, and political boundaries.

Environmental boundaries are the natural processes and elements that limit the kinds and quality of relationships people can have with the land. For example, iron mining can occur only in places where geological conditions produced iron ore. Natural processes also determine the grade, distribution, and amount of the ore.

Perceptual boundaries are the walls of our world views, built out of beliefs, attitudes, values, and faith. They determine the meanings we attach to places, for example (such as Yellowstone National Park), and limit the culturally acceptable uses for those places.

Political boundaries are implied by the lines on a map that represent the geographical jurisdiction of a government or government agency; they consist of the accompanying legal limits to the agency's decision-making power, and of the policies created within those limits.

Changes within any one of these boundaries will affect the others.

A biosocial system can be defined as an economy, which can lead to a system of resource management. The availability and quality of resources limits the possible kinds of economic relationships, and the time span of those relationships. In other words, environmental boundaries place firm limits on the ways people can live on the land, and also determine the length of time a resource can be used at any given rate of use. Perceptual and political boundaries add further restrictions, limiting human-land relationships to what is culturally acceptable and politically possible.

Figure 1. shows a model of a biosocial system, using the boundary concepts described above. The double-headed arrows indicate the reciprocal nature of the relationships.

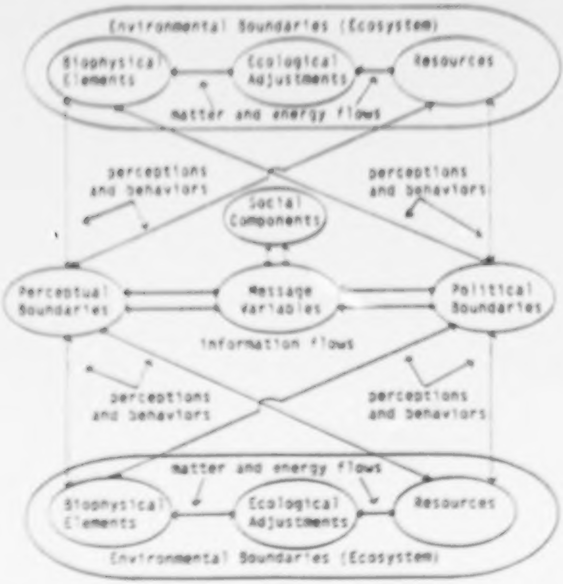

Environmental Boundaries (Ecosystem)
Biophysical Elements
Ecological Adjustments
Resources
matter and energy flows
perceptions and behaviors
perceptions and behaviors
Social Components
Perceptual Boundaries
Message Variables
Political Boundaries
information flows
perceptions and behaviors
perceptions and behaviors
matter and energy flows
Biophysical Elements
Ecological Adjustments
Resources
Environmental Boundaries (Ecosystem)

Figure 1. The Biosocial Boundaries Model

For the moment, ignore the top third of the model, which seems to merely duplicate the ecosystem at the bottom of the model. I'll explain its presence later. The ecosystem, it should be noted, contains all of the biophysical objects (some of which become resources) and ecological adjustment processes (such as the nitrogen cycle, fire, and the flow of energy through trophic levels) in a given area of space and at a given time.

A student using the model to study a particular issue would place individuals and groups into one of three compartments. All those having a direct interest--psychologically, economically, or politically--in what happens to the particular resources being examined should go into either the perceptual boundaries compartment or the political boundaries compartment. Governmental groups with decision-making authority over the resources in question go into the political boundaries compartment. All others with a direct interest in the resources being studied go into the perceptual boundaries compartment. All individuals and groups with no direct interest in the resources, but who are part of the information networks of the others, are part of the social components compartment.

It is possible to move individuals and groups from one compartment to another as their relationship to the resources changes. Congress and the courts belong in the social components box unless they become involved in the issue being studied. Then they would go into the political boundaries compartment.

Message variables can include the content, source, and method of communication. This is also the logical place for the student to insert relevant economic, sociological, or political theories (for example, models of the legislative process, or political economy). The double sets of arrows leading to and from the message variables compartment are redundant, but serve as a reminder that each of the other compartments contains a number of individuals and groups, and communication occurs among those *within* a compartment as well as from them to those in other compartments. It must be made clear that it is not the boundaries themselves that are perceiving, communicating, and acting, but individuals and groups.

Besides identifying the relevant individuals and groups, the student also must decide what elements within the ecosystem are relevant to the issue at hand. What are the key resources, for example? This leads to the obvious question, Who values these resources, and for what reason(s)? Using the model then becomes a matter of paying careful attention to the possible interrelationships, as indicated by the arrows. In a study of clear cutting, for example, the perceptual boundaries of the loggers lead them to value trees for their lumber. Preservationists, on the other hand, may value the same trees for other purposes. Either cutting or not cutting the trees will have specific environmental consequences that will, in turn, affect the perceptions of those involved. Communication (via the message variables compartment) will play a key role in the issue's creation and resolution. If the government becomes involved (political boundaries compartment), a possible outcome could be the creation of a new law; its implementation, in turn, will have specific environmental and social consequences.

Why the extra ecosystem at the top? It serves as a reminder that no biosocial system is an isolated unit. Any biosocial system is interlocked with other biosocial systems, and the events in one are shaped in part by the events in others.

For example, the three leading outdoor magazines--Field and Stream, Outdoor Life and Sports Afield--published nearly fifty feature articles about the Quetico-Superior wilderness of Ontario and Minnesota during the 1930s, emphasizing the great fishing available there. During the 1950s they published just ten. Northern Ontario contained the fishing frontier of "virgin lakes" for a new generation of wealthy anglers, and was covered in dozens of features by the three magazines. The publicity given to northern Ontario drew some of the wealthy, resort-supporting anglers away from the Quetico-Superior. In other words, the ways in which they perceived other places affected the ways in which they perceived (and therefore used) the Quetico-Superior.[1]

The biosocial boundaries model helps students to study these intersystemic relationships. The individuals and groups included in the social system part of the model would be all of those having a direct interest--psychologically, economically, or politically--in what happens to particular resources in either ecosystem (or all, if more than two are included).

Because the interactions between a society and its environment are so complex, it is easy for students to get lost in the tangle and either miss important relationships or poorly organize them. The biosocial boundaries model, by focusing on the interactions among three major concepts--perceptual, political and environmental boundaries--creates a useful organizational framework designed to highlight the key society-environment interactions.

Notes

1. The original formulation of biosocial theory appears in Thomas M. Boonicksen, "A Biosocial Analysis of Fire Management Decision-Making for Brushland Watersheds in Southern California" (Ph.D. dissertation, University of California-Berkeley, 1978). See also Thomas M. Bonnicksen and Robert G. Lee, "Biosocial Systems Analysis: An Approach for Assessing the Consequences of Resource Policies," *Journal of Environmental Management* 15(1982): 47-61. Biosocial theory expands upon the perspective established by Walter Firey in *Man, Mind and Land: A Theory of Resource Use* (Glencoe, Ill.: Free Press, 1960).

The literature examining systems theory is voluminous. A good starting point to learn about competing perspectives is Daniel Stokols, ed. *Perspectives On Environment and Behavior: Theory Research, and Applications* (New York: Plenum Press, 1977).

2. The model is described in more detail and applied in David James Backes, "The Communication-Mediated Roles of Perceptual, Political, and Environmental Boundaries on Management of the Quetico-Superior Wilderness of Ontario and Minnesota, 1920-1965" (Ph.D. dissertation, University of Wisconsin-Madison, 1988).

3. See Backes, "The Communication-Mediated Roles."

FAT SCIENCE VS FAD SCIENCE: THE PROCESSES AND PRODUCTS OF A TECHNOLOGY-CENTERED ENVIRONMENTAL SCIENCE CURRICULUM

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Abstract

Building around the "student-as-worker" concept, field tested, technology-centered, multi-faceted learning strategies for secondary student success will be presented. Techniques used during curriculum development and performance based assessment tools will be discussed. The scientific method is central in the curriculum which employs "teaching from transfer" learning activities.

FAT science has nothing to do with the latest FAD in dietary considerations for humans. FAT science refers to the common practice which is found in many classrooms today, the practice of the Fine Art of Teaching (FAT) science. This places the responsibility for the student success in science heavily upon the teacher. FAD science focuses on the evolving practice of the Fine Art of Doing (FAD) science. Here the responsibility is shared by all participants for success in science.

Environmental science as a specific curriculum was new in the Jefferson County Public Schools for the 1989-1990 school year. It is offered as one option for meeting the required three (3) units for high school graduation. This class was designed for students who would not likely be science majors. Many of the students will not attent college. These students need alternative methods to a textbook driven curriculum with a heavy focus on FAT science.

Working under a grant from the U.S. Department of Education, teachers came together to develop technology-centered lessons employing a variety of teaching strategies including cooperative learning, multimedia, and "teaching from transfer." Throughout the year the developed lessons were used with the students and revisions made to increase their effectiveness.

The project began by defining the characteristics of the student. Working in small groups the teachers developed a student profile. Each group shared their findings and the merged findings reflected the profile of the students in the classes. The group work followed the model of (1) time to reflect, (2) sharing one idea in turn, (3) clarifying, discussing and refining, and (4) developing a final report. The convened groups shared their findings to compile a composite profile. The teachers were encouraged to use each method with their students.

Building on the "student-as-worker" concept. lessons called upon the student to become actively responsible for their success in the class. "Teaching from transfer" resulted from making connections to the real world for bringing relevance to student learning. As these connections were established, the learning moved from a task assigned by the teacher to ways in which the student can have a positive impact upon their world. For example, to make connections with the environment, students were asked to write an environmental autobiography. They received a prewriting planning sheet which specified the types of information to be included in their autobiography. Class discussion focused on clarifying the assignment and definition of unfamiliar terms.

The students developed the criteria for evaluating the autobiographies as they described the characteristics of writing they considered interesting. Technology became involved as the students composed their documents at the computer. The work was saved and printed. Peer editing and revising occurred; two final copies (one single spaced and one double spaced) were printed and placed in their portfolios.

Next, the groups of students gathered data to build a biomes database. Questions for searching the database guided the study. When agreement about the material in the database was reached, each student was then asked to take their double spaced environmental autobiography and circle anything which would be different if they lived in another biome. The circles were numbered and appropriate material from the biome database was matched with the numbers. The students used the find and replace function of the word processor to revise their autobiographies for their assigned biome. Through telecommunications, the revised biomes can be shared with people living in that biome. This real world connection encouraged quality assignments.

To promote mastery learning a biome HyperCard stack was created. The students were provided with clip art of fauna and flora for all studied biomes. They were to copy and paste appropriate pictures onto a new card in the stack to depict an assigned biome. On a second card they were to describe their biome picture, explaining the environmental significance of each of the facets they included in the biome. The biome picture and description were printed. This assessment had the student applying the gathered knowledge, requiring use higher order thinking skills rather than factual recall.

Activities designed to focus student attention on their impact on the environment included spreadsheets which calculated the weight of garbage generated by each home for one week. The statistics were compared with the 3.5 pound average for domestic solid waste. Class garbage pounds were figured, then projected for one year. Using textbook data for various types of domestic solid waste, the spreadsheet calculated how many pounds of each type of waste their families generated in one year if they fit the average. Graphs intensified the significance of the findings.

This became a natural springboard for examining the composition of domestic solid waste, thereby establishing another real world connection. The students involved their families in tabulating the number of times they threw away plastic, paper, metals, etc. Following data analysis, the students explored alternatives which could be used to reduce the amounts of the various types of waste. Problems associated with the various types of waste were discussed and environmentally sound alternatives proposed. The advantages and disadvantages of recycling naturally grew out of the study.

A videodisc provided information about landfill operation. Students determined how long it would take to fill their classroom with garbage if it were a landfill. Alternative disposal methods were evaluated and the environmental soundness of these alternatives discussed. Uses for byproducts of the landfill operation were explored.

Students studied waste disposal via the sewer systems. Surface water quality analysis provided insight into the nature of pollution problems present in the community. Possible sources of the pollution found in the streams raised consciousness about the significance of how we care for our lawns and gardens.

Energy study examined the relationship of the amount of carbon dioxide generated to the kilowatts of electricity used. The quantity of carbon dioxide resulting from the generation of electricity for the class was figured using a spreadsheet. Ways of reducing the amount of electricity used without reducing the quality of life were investigated. Alternative energy resources were tested with environmental significance of each considered. Renewable versus consumable considerations heightened student awareness for the need to change consumption habits.

Authentic assessment materials (AAM) provided an equitable assessment of student's work. One purpose of the AAM was to offer the student open ended questions. The strengths and weaknesses of the student could be more easily addressed. Scoring rubrics were developed and applied to projects. These projects called upon the student to be a knowledge worker. How the acquired learning was applied to a given problem indicated the level of student mastery of the studied concepts. Diagnostic short answer questions enabled the teacher and student to monitor the mastery level of critical information in preparation for the application and/or synthesis activities.

Some activities were graded individually; others were group graded. Journals validated the involvement of all members in group activities. Connections to the real world in the investigation of problems eliminated the "you need to know this" syndrome. By getting the horse before the cart, the reason for studying the material became patently obvious at the outset. Proposed solutions were addressed to real world individuals or groups. One medium was posters or collages which sought to change the behaviors of their peers. Another form was position papers written and evaluated using the scoring rubrics. Revisions made for quality papers. These papers were sent to appropriate leaders. Multimedia presentations enabled the visual learner to apply the acquired knowledge in a mode that may more effectively address the intended audience. The process of determining effective multimedia offered the opportunity to examine the ways the media influences us.

Newsletters prepared for their peers offered another medium for raising consciousness about the importance of caring for the environment. Panel discussions presented to the student body heightened the student's self-concept and gave reason for mastering the material to be presented. Opportunities for the students to function as the resident experts on a topic regularly occurred. Multifaceted learning activities provided avenues for all students to achieve mastery learning.

Throughout the entire project the design of the activities fostered developing scientific method skills. FAD science may take longer; however, it internalizes learning. Occasions for practicing FAT science occur, but they are not the primary modus operandi. When the teachable moment arrives, FAT science addresses that current situation and only provides sufficient information to facilitate the students independently discovering the information. FAT science does not promote the long term retention of knowledge which results when the "student as worker" concept prevails and the teacher functions as a member of the learning team, a participating facilitater in learning.

STRATEGIES FOR AN INSTRUCTIONAL DESIGN IN STS-EE AT THE UNIVERSITY LEVEL

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Abstract

This presentation focuses, in the context of STS curricula, on specific strategies that fulfill the basic requirements of EE. Such strategies facilitate the development of a sense of urgency and the need to take action, of value clarification and behavioral changes. They further allow a personalized step by step approach in knowledge acquisition, practise and evaluation.

Although it relates to demographical, economical and technological factors, the underlying cause of environmental degradation is predominantly cultural. A better understanding of the intricacies of Man's impacts on the Environment help raise the concerns on their effects, concerns which may bring changes in our behaviours.

The most important corollary of any human's settlement is the introduction of a commanding use of science and technology for its life support. Because of the overwhelming activities generated, scientific and technological "components" do overspills and upset the homeostasis of even the wilderness. Those impacts makes any former undisturbed natural ecosystem a man-made environment which evolution won't follow the natural laws of ecology.

Moveover, technology is part of our cultural environment, it plays a role in the moulding of individual and collective values and attitudes. For all those reasons, scientific literacy is now a necessity for Man to adequately perform in a "modern" world. In short let's say that there is an urgent needs for some form of environmental education adapted to pure, applied and humans' sciences curricula. They are some difficulties arising in the implementation of environmental studies in most sciences faculties which are all characterized by disciplinary structure. Unfortunately, this situation is often reenforced by the students attitude towards social sciences[1], humanities an political sciences[2].

In spite of that there are windows of opportunities for some forms of environmental education through elective activities. In fact we have been amazed by the popularity of classes pertaining to STS-EE studies. Furthermore we have seen the overall ratio of students from human' sciences increase to the point where a make up of any classes reflect the average ratio of the student faculties' body.

The difficulties: However, in the framework of "global" competition between elective subjects we have to be aware that students have preferred criteria of classes slection, even for the environmentally conscientious, which are:

- overall marks average
- work load required
- perceived utility (in a rather short term).

These criteria are intertwined and may proportionally vary. We must design a specific pedagogical strategy that maximizes the perceived utility of environmental studies and secures the student in relation to the process of evaluation and time required.

This is not easily done as the main characteristic of wide accessibility for all university' students leads to heterogeneity: heterogeneity in prior scientific knowledge and in student's expectations. Furthermore because of the generally greater motivation of mature students for environmental studies we may have more of them in such classes which bring other sets of constraints.

The main objectives of STS-EE education: The primary objectives of STS and Environmental education must be to commit students to the cause of environmental conservation. In other words we must at least expect a desire for behavioral changes and desire for local action in environmental causes.

The needs for an Instructional Design: Obviously the preset conditions lead us to a double approach in conceiving an instructional design. One, adapted to the knowledge acquisition phase of the course, should rest on a strategy along Bloom's concept of mastery learning. The other refers to a methodology and interests related to environmental education and must transform and above constraints of heterogeneity in a synergetic effect of student motivation. It should also be noted that this heterogeneity reflects society's diversity. The overall strategy must convey human values, attitudes and behaviour in "normal" anthropic settings well suited to convey the nature of the problems related to Man's actions in his habitats: domestic, rural, urban and industrial environments.

Furthermore the "vector" for such a process should introduced the student to citizenry "militancy" or "political" action at the municipal level. The municipal scene is everybody's backyard. It is the one where the challenger of problem solving and sense of just cause is readily attainable.

The EE's value clarification objective is, from our point of view, better reached in controversial situation among peers, where the only dignified way out is through team work and "give and take".

We tried several kind of pedagogical strategies, all centered on urban or national issues: cases studies, "environmental diary", court procedurals and role playing. They all have their advantages and a complete instructional design should use more than one of them. However, in the case of urban affairs, role playing was found extremely rich in possibilities and effectiveness.

We will expand on such an experiment, in a typical political framework of mayor and municipal council, with commissions and citizenry comities; each one with its specific constraints and interpersonal nature of communications. The role playing lasted for 35 hours in class setting under direct supervision (the invested time was a lot more). It was developed in partnership with the provincial Office of Communication and Education of the Ministry of Environment, and the Office of energy efficiency of the Ministry of Energy, Mines and Resources.

Endnotes

1. This phenomena is not limited to pure or applied sciences, we find the same bias in the faculty of human sciences wherein such topics as the complex interrelations between sciences, technologies and society are too often limited to the philosophical, historical, political and social aspects of the problems.

2. In "Confessions of a recent graduate: part II" Norm Ng, Director Student Programs, American Institute of Aeronautics and Astronautics, in "AIAA student journal, V.26, no. 3, p. 34, 1988".

Have all classes helped you with your job? Yes 16 percent, No 84 percent. Classes on the lower end (i.e., least beneficial): chemistry, the social sciences, humanities and politics.

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BAT AWARENESS TEAMS: A MODEL FOR ENVIRONMENTAL PROBLEM SOLVING

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Abstract

Bat Awareness Teams, or BAT Clubs, is an elementary school science project in the Austin Independent School District. Co-Sponsored by Bat Conservation International, the project involves students in problem solving activities which culminate in a community awareness-raising product. These activities can be generalized to any environmental education project.

Background Information

Austin, Texas is a privileged city because of some very special inhabitants. Besides our large urban school district and our many gifted youngsters, Austin has a large population of Mexican free-tailed bats living under the Congress Avenue Bridge downtown. Almost every evening between March and November, the entire colony of about 750,000 bats exits towards the southeast in a sight that has become a favorite tourist attraction for Texas' capital city.

Another special Austin inhabitant is Bat Conservation International, an educational organization dedicated to the protection of bat species worldwide. Dr. Merlin Tuttle, founder and director, travels and lectures audiences internationally to alert people about the importance of conserving their bat populations.

Taking advantage of these unique inhabitants and the resources they provide to Austin schoolchildren, the AIM High Science Program, part of AISD's elementary school gifted/talented program, took on the creation of Bat Awareness Teams, or BAT Clubs, in 1989. A small group of interested teachers met initially to suggest approaches and ideas for teaching about bats. Curriculum lessons were then written in the form of a series of twelve learning experiences, and material kits were developed which contained books, articles, a slide presentation, and a bat detector device. The materials kits were funded by a board member of Bat Conservation as well as by businesses in the area of the Congress Avenue Bridge. Twenty teachers signed up to lead BAT Clubs at their schools, and their response has been very encouraging. The teachers report that their BAT Club members are extremely interested and motivated, and the teachers themselves are very excited about the project and its results.

Description of the BAT Club Lessons

The BAT Club lessons were written for grades K-6, the same concepts are presented to each grade, but a series of increasingly complex activities are listed in the lesson plans. The teachers decide, then, which activities to lead, depending on the age and abilities of their students.

The series of lessons begins with a review of what students already know--or think they know--about bats. Students then view a slide show and check their original conceptions. Older students look at the slide show with a special task in mind: to notice instances in which humans have made an impact on bat populations, and to begin to identify "weak links" in bat ecology.

The concept of a "weak link" applies to a point in an animal's life cycle or habitation which makes the species especially vulnerable to predators or humans. In the case of many birds, for example, a weak link is too narrow a range of food sources; when those foods become unavailable, the species is forced to abandon the habitat, or even perish. Since natural selection favors those individuals which are able to adapt to changes, populations which cannot do that are vulnerable. Intermediate students keep on-going lists of weak link notations during their studies on bats.

The BAT Club lessons continue with additional content information on bats, as teachers make and use transparencies to show the differences between the Megabat and Microbat suborders, explain bat anatomy and compare it to human anatomy, and share information on the Mexican free-tailed bat which inhabits our city. Students then begin simulation games which are designed to make the abstract concepts of ultrasound and echolocation more concrete.

After this content information has been presented, the students are led through a series of problem solving strategies that make the BAT Club project a model for other environmental education curricula.

A Model for Environmental Problem Solving

The students have learned a lot about bats: they have learned through books and slides, and they have simulated what it's like to be a bat; they have identified some "weak links" in bat ecology and some points at which humans have impacted bat populations. Now they're ready to take their learning toward a purpose, and they not only demonstrate what they have learned but also begin to make a difference in the conservation of bats. The following problem solving steps take place over several lessons.

STEP 1: Brainstorm to identify Problems about Bats
The brainstorming process involves a non-judgmental, free flow of ideas. Used especially as a strategy in gifted education, this approach to problem solving is also used in industry and corporate settings. The students are asked to name as many problems as they can concerning bats, and the teacher writes down all of the student's ideas.

STEP 2: Develop Criteria
Teachers discuss each problem with the students so that all agree on the intended meaning of the problem statement, then they ask students to determine how to choose the most important problem to them (or a problem concerning the local Austin bats). Students may identify criteria concerning the number of bats or humans affected by the problem, for example, and that criteria will help them select a problem on which to focus.

STEP 3: Select a Problem
Using the criteria they developed, students select one of the problems they identified to be the focus of their efforts.

STEP 4: Brainstorm to identify some Solutions
Students again brainstorm, this time focusing on the selected problem and some possible solutions. Teachers help students distinguish between "do-able" solutions and those which would be impractical for them to actually carry out. They may decide that simply telling people about the problem is the best solution.

STEP 5: Write a Message
Teachers help students word the problem (and solution, if desired) into a message. An example:

> Problem: If bats are disturbed while they sleep they can die.
> Solution (optional): Place "Do Not Disturb" signs under the Congress Avenue Bridge.

STEP 6: Select an Audience for the Message
Students are shown a list of possible focus groups, which can include students at the school, PTA members, people who shop at a certain store, people who live in a certain neighborhood, city council and other government groups, etc. From this list students select one audience to receive the messge.

STEP 7: Implement the Community Awareness-Raising Solution. Students look at a list of possible forms products can take, including flyers, door-hangers, posters, videotapes, letters, etc. They select a form and begin working in teams to create products which will spread their message about bats to the audience they have chosen.

STEP 8: Disseminate the Products
The products which the students have created are handed out or mailed to the focus audience.

Culminating Activity for the BAT Clubs

After the BAT Club members have carried out the problem solving and have raised community awareness about bat conservation, they celebrate with a field trip to the Congress Avenue Bridge. Besides enjoying the spectacle of emerging bats, the students act as on-site interpreters for the many visitors and Austin residents who converge to watch this sight. Wearing buttons which read "ASK ME ABOUT BATS!", the BAT Club students are in place to answer questions from the public.

Conclusion

Bat Awareness Teams have been successful not only in teaching elementary students about bats, but also in teaching them that everyone can do something to improve environmental quality. The problem solving which students experience leads to a community awareness-raising product which gives this form of curriculum a unique end result: instead of being tested on the content information, students are asked to use the information for a practical purpose. This approach presents an environmental education strategy which can be used in teaching about any other animal, natural feature, or ecological problem, and has the potential of awakening the grassroots activism that will make our students effective in the real world of ecology action.

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STIRRING UP THE STEW--
HOW ENVIRONMENTAL SIMULATION ACTIVITIES STIMULATE BROADER PERSPECTIVES CONCERNING ENVIRONMENTAL ISSUES

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Environmental simulations help students understand why values and interests of different organizations usually cause conflict before resolutions occur. Learn to use a model that allows students to develop, defend, and negotiate their proposals as an identifiable interest group while the facilitator maintains neutrality and introduces the process of consensus-building.

A WORKSHOP INTERDISCIPLINARY EXPERIENCE IN CHIAPAS

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INIREB organized interdisciplinary environmental education workshops that reached about 700 elementary and kindergarden teachers. Evaluation indicated that the workshop impulse lasted about three months. A suggested strategy is proposed.

HABITAT STUDY

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A "hands-on", in-depth investigation of a square meter to discover living organisms. Observing and collecting specimens determines interactions between living things and their environment. Careful removal of debris reveals organisms above ground, digging reveals organisms living in soil. Concepts such as organism, population, habitat, community, ecosystem can be discused.

PROJECT O.C.E.A.N.

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Abstract

Students need to understand that human interaction with the open ocean and coastal environment will be the deciding factor in that delicate ecological balance. In Project O.C.E.A.N. students study the physical, biological, and human interaction aspects of the ocean and how this affects the entire planet.

H.G. Olsen Elementary School began a project in conjunction with the Port Aransas Clean Team (now Keep Port Aransas Beautiful, Inc.) called Waste-In-Place. Through this the students studied and classified litter, expressed a preference for a litter free environment, made a litter sculpture and designed posters to put Waste-In-Place. Through this the students became aware of litter as pollution to their environment.

In light of this heightened awareness of their environment, the students began a study called Project Ocean. This was particularly important in that they live on a barrier island on the Gulf Coast and the future of this coastal community and all living things belong to them. The students won first place in the Keep Texas Beautiful Yough Leadership Awards, multi-group category in 1989 for this project.

Port Aransas is a community of 2,212 people. Port Aransas Independent School District is located in the City of Port Aransas, Nueces County, on the northern tip of Mustang Island. The school district's northern boundary lines extend across the Aransas/Corpus Christi Ship Channel and encompass portions of Aransas and San Patricio Counties. The southern boundary lines extend approximately 15 miles south on Mustang Island and includes Mustang Island State Park. The district includes H.G. Olsen Elementary Schook, Ancel R. Brundrett Middle School, and Port Aransas High School. The primary industries are fishing and tourism. With the emphasis on Waste-In-Place, our students have participated in the Texas Beach Clean Up. Though the fishing industry has begun to be addressed as the students study the gulf, bays, and estuaries, the success of this industry depends on clean and unpolluted water. The coastal environment has a delicate ecological balance. It is crucial that this be taken seriously and steps made to preserve this ecological balance. One way to help people understand this balance and in turn learn to help preserve this environment is by introducing a study of marine science in the elementary school beginning with the early childhood class and including classes through high school.

Project Ocean is a K-8 Marine Science Curriculum developed by Ocean Alliance (formerly the San Francisco Bay Chapter of the Oceanic Society). It has been used successfully in California Schools as well as in Reno, Nevada. Port Aransas Independent School District was the first Texas school district to implement this curriculum. Each grade level studied a different marine habitat. During this study the students learned about the physical and geological factors that affect coastal habitats and the plants and animals in those habitat. The seven marine habitats studied are: rocky seashore, sandy beach, marshes and mudflats, bay and estuary, kelp forest, and open ocean (Project O.C.E.A.N., San Francisco Bay Chapter of the Oceanic Society, 1988). In Port Aransas the habitat guides were adapted for the local geographical area. The habitats studied are: rock jetty, Gulf beach, mangrove marsh, turtle grass beds, Gulf of Mexico, barrier islands and intracoastal waterways. Each habitat is broken into three areas: the physical setting, plants and animals in that setting, and the human impact on that setting. By studying each area by grade lvel the student has a chance to learn about all the habitats and our impact on them during his/her career in the Port Aransas Indpenedent School District.

Each grade level has a habitat guide. The guides include grade levels K-8. In Port Aransas Pre-K was also included. The guides contain lesson plans organized with a summary, a focal concept, background information, science process skills, vocabulary, time required, materials, activities, discussion, teaching strategies, and extensions (Project O.C.E.A.N., San Francisco Bay Chapter of the Oceanic Society, 1988).

The learning approach is cooperative and multisensory. The students have an opportunity to see, touch, taste, and manipulate the habitats. This approach uses techniques to address all learning styles.

After several weeks of integrating activities into regular science programs, Project Ocean culminated with a school-wide Ocean Week during which the whole school was turned into an ocean. The ocean became the focal point of the entire elementary and middle-school curriculum. Math classes graphed the tides, Science classes tested the water quality, studied the anatomy of squid and fish and tasted calamari. The art classes sketched whales, made life-sized dolphin sculptures, and each child contributed a hand made quilt square for wall hangings. English classes read sea stories, wrote marine related stories and reports and compiled a cookbook of seafood recipes. The whole school became an integrated laboratory for studying the marine world. Field trips, guest speakers and special assemblies complemented the classroom studies.

All groups participated and supported this project. The support began with the Port Aransas Independent School District School Board making a commitment by funding this endeavor. The administration was supportive in making a commitment for providing release time for the teachers' training. It is estimated that 600 volunteer hours were spent during this project. This included subcommittees to handle coordination of resources, guest speakers, student projects, parents, community involvement, public relations, news coverage, and field trips. The committees met weekly to organize events for the week's celebration. All committee meetings were held after school which meant classroom teachers devoted many additional hours. Special student projects such as constructing dolphin sculptures and the Challenge Newspaper were completed on Saturdays and after school hours. For example, the special education students went to St. Joseph Island to pick up trash. A summary of that day's activities on the beach clean up was written by the students and then published in the Gulf Coast Conservation Association's Bulletin, Tide Magazine. This year, April 1990, the plastic picked up on St. Jo was added to the Texas Beach Clean Up's plastic and sent to the experimental project of Exxon to make park benches for several Gulf Coast communities including Port Aransas.

Another student group, the Challenge Class, interviewed classes, took pictures, evaluated the project, and then published a newspaper. The high school industrial arts class completed their boat building and displayed two wooden boats that are appropriate for island fishing. The high school marine science class supervised the squid dissections performed by elementary students and organized marine related activities for 200 elementary students at the ending celebration at the beach.

Outside participation and community wide contributions were part of Project Oceans' success. The Director of Marine Education Services at the University of Texas Marine Science Institute was instrumental in getting this program for the Port Aransas Independent School District. This was a pilot program for the state of Texas. The University of Texas Marine Science Institute participated by providing teacher training, speakers, field trips and resources.

The Parent Teacher Organization organized a beach celebration for 200 elementary students which included games and lunch. A highlight of this celebration was the students outlining a hugh whale on the beach. A parent took an aerial photograph of the whale.

The community businesses participated by providing boat transportation to St. Joseph Island and printing the winning students' logo designs on T shirts. These T shirts were given to every student who participated in Project Ocean.

The South Jetty Newspaper and a local citizen provided resources for printing the student newspaper and news coverage. The Port Aransas City Council made a proclamation for Ocean Week. The Port Aransas City Library provided resources. The Nueces County Park employees helped with the beach celebration. The Texas House of Representatives made a resolution for Ocean Week and presented the resolution and a flag flown over the Texas Capital to the students.

The youth, with their heightened environmental awareness, will be leading their community in helping to preserve and protect our fragile barrier island. In light of the Alaskan oil spill and other ecological disasters, this awareness is crucial. As responsible citizens and future leaders of the Gulf Coast Region, our students will be able to make informed choices due to their participation in Project Ocean.

INVOLVING LEARNERS IN ENVIRONMENTAL ISSUES AND ACTION

Jerry Culen
Trudi Volk
Harold Hungerford
Southern Illinois University
Carbondale, Illinois

This session will present recently-developed cirricular materials for involving K-12 learners in environmental issues. The materials take students from awareness through active participation in citizenship action, and are based on a model which has been successfully implemented from kindergarten through the college level.

TEACHING TECHNIQUES FOR ENVIRONMENTAL EDUCATION IN THE GIFTED AND TALENTED CURRICULUM

Michael Cunningham
Mineola, Texas

Abstract

This presentation will show how any teacher can add an exciting environmental education unit to their gifted and talented program for little or no cost and with tremendous positive results for both the student and our society. The program is based on social reconstructionism and is centered upon active student involvement in their education and their environment.

Let's put an "E" back into education. That "E" is the environment! With the plummeting level of learning rapidly suffocating the hallowed halls of public schools everywhere, parent and educators alike are desperately searching for new ways to educate today's gifted students. What were but a few faint voices from afar have now reached a crushing cresendo of protest yelling out, "Put 'E' (excellence) back in education!" Can we, as a society, turn a deaf ear to this urgent, desperate, simple demand? What better can be done then to re-establish excellence in our educational system through the interjection of an integrated environmental unit into your gifted and talented school.

In many areas and in many ways, today's gifted public school pupils have a distinct technological advantage over previous generations. They have better and more sophisticated material and supplies, an awesome array of audio-visual equipment, and the daily use of computers at both the school and at home. However, by any means of moder judgement, these incredible and impressive material advantages have failed to provide or even produce great leaps of learning for the individual student. The more our traditionally urban students are away from any sort of rural roots or ties, the greater the need is for more and more environmental education!

Fancy gadgets, high tech tools, and new teaching techniques have placed greater demands on our educational system to produce greater leaps of learning for the student and a greater sense of satisfaction for the teacher. Without receiving success, is it any wonder that many teachers and students alike are wondering our loud if anything will work? Or if anything can stem the tide of constantly lowering levels of learning and failing levels of academic achievement?

It is for this exact reason that this model was designed by Michael Cunningham for use in the social studies/science courses in both the middle school and high school levels. This concept was submitted to Dr. John Abbott, Mineola I.S.D. Curriculum Director, as well as Dr. Robert Windham, Professor of Secondary and Higher Education at East Texas State University, Commerce, Texas. However, the real or actual goal of this model and all of this research is that this program actually become a working model of environmental education and not some sort of highly debated, nice theory. Education is something that we as teachers, supervisors, and administrators can do something about! When little is expected or asked for, little is actually accomplished! Whereas, great things can and will be done by highly motivated gifted students if they are only asked and challenged to do so!

Gifted students have a greater ability to be able to understand environmental issues because they can see the broad (global) picture much better and they understand problems much better on a global basis than do average or bellow average students. With this in mind, the following program was designed to be implemented in Mineola Middle School for the Gifted and Talented Earth Science Program that should start in the fall of 1990.

The basis of this program will become the nucleus of the 90/91 Gifted/Talented Earth Science Program and the foundation of this model. During the pilot phase of the 1988/89 and 89/90 studies many ideas were discussed and the program was designed in such a way that it would fit into almost any type of GT program on the seconday level. The Cunningham Model can be conducted at relatively little or no cost to the school or the student. It makes extensive use of outside materials, resources, and use of your local media.

Cunningham Model--The Three P's

Publicity -	use of the local media to feature stories about your students' work and accomplishments in cleaning up the environment.
Promotions -	extensive use of contests, posters, handouts, and videos to augment your regular curriculum. Active learning is the best form of learning!

Petitions - making student signed petitions and having students learn about the government by actually petitioning local, state and national officials about important issues of the day!

Areas Of The Curriculum Stressed

1) Writing across the curriculum
2) Critical thinking skills
3) Different aspects of learning (Art, science, poetry, posters, environment)
4) Developing strong self esteem and esprit de corp with nature
5) Higher levels of thinking skills
6) Creativity on the part of the teacher and the student
7) Low or little cost
8) The relationship between mankind and the rest of the earth
9) In harmony with mature concept of living
10) Fun and excitment return to the classroom with learning as its objective

This model is a student centered, teacher directed attempt to put additional information before the student. The model conforms to the gifted student profile as defined by Dr. Sandra Kaplan. It is presented as a challenging, motivational, and often creative process. It directly fulfills the essential elements of an environmental lesson while giving the teacher the ability to bring all kinds of extra materials into the classroom. This model can offer the GT student the following:

1) Quick mastery and a real sense of actual accomplishment
2) Nonconforming process of learning
3) A questioning attitude
4) A concern about world problems
5) A wide range of different interests
6) New and fun challenges
7) More freedom in which to learn

The Importance Of Environmental Science

Environmental science is the most important course taught in our secondary school today! It is the only one to put all ideas and subjects into some sort of directed focus. Therefore, it should be a common core course stressing the interrelationships of math, history, reading, language arts, geography, and earth science! Upon this base, students should be able to develop, use, and improve their analytical thinking skills.

The most critical skill that any well-rounded, gifted curriculum should have is the analytical thought process. Environmental studies is the best medium in which a student can learn the proper way to compare and contrast differing events and then be able to correctly analyze their results.

Suggested Lessons--Theme Weeks Of Learning

1) National Arbor Day	100 Arbor Avenue, Nebraska City, NE 68410! This is an excellent source of information and curriculum materials for any school. You get trees, proclamations and an abundance of information.
2) Izaak Walton League	1701 North Fort Myer Dr., Suite 1100, Arlington, VA 22209. Adopt a stream program. One of the best ideas for a class project that has ever come about. They provide lesson plans, field trip information as your students actually help your community as they learn.
3) World Health Day	American Association for World Health, 2001 S. St. N.W., Suite 530, Washington, DC 20009. April 7th each year-theme "Our planet, our health, Think globally, act locally."
4) Free Our Public Lands	Lynn Jacobs, P.O. Box 578, Tucson, AZ 85703. Information on the controversy of public held lands in the western part of the United States being misused.
5) Adoption Programs	Adopt a whale--excellent curriculum materials Adopt a turtle--great teacher guides Adopt a Manatee--excellent teacher materials and videos

Resources

Animal Welfare Institute, P.O. Box 3650, Washington, DC 20007

Cunningham, Michael. "Essential Elements of A Gifted Child", Clearing House, Washington, DC. 1990.

Free Our Public Lands, P.O. Box 578, Tucson, AZ 85703

National Arbor Day foundation, 100 Arbor Avenue, Nebraska City, NE 68410

Walton, Izaak League, 1701 N. Ft. Myer Dr., Suite 1100, Arlington, VA 22209

World Health Day Foundation, 2001 S. St. N.W., Suite 530, Washington, DC 20009.

ENVIRONMENTAL LITERATURE IN THE HIGH SCHOOL ENGLISH CLASS

J. Wilfred Cwikiel
Ann Arbor, Michigan

This program will highlight various aspects of an environmental literature unit infused into an American Literature course at a public high school. The unit utilizes methodologies such as "writing to learn," cooperative learning, and peer editing while engaging the students in their own environment and selections from Carson, Leopold, Muir and Thoreau.

LA EDUCACION AMBIENTAL EN YUCATAN

Rafael Robles de Benito
Yucatán
México

Abstract

Yucatan has had a great deal of development regarding the protection and conservation of the environment. Environmental Education is one of the priorities.

Introduccion

El estado de Yucatán ha tenido una muy breve historia en materia de educación ambiental. De hecho, si bien es cierto que algunas organizaciones no gubernamentales han

hecho esfuerzos por emprender actividades mas o menos aisladas de formación de conciencia ambiental, y a pesar de que el Gobierno Federal, a fines de los años ochenta, pretendió llevar a cabo un programa sistemático de educación ambiental a nivel nacional, la verdad es que se puede hablar del inicio de un programa estatal de educación ambiental a partir de 1988.

El año de 1988 es un periodo afortunado para quienes estamos involucrados en la gestión ambiental en Yucatán: el acceso al poder del Gobernador, Lic. Víctor Manzanilla Schaffer, profundamente comprometido con las causas conservacionistas y empeñado en lograr que el Gobierno Estatal asuma una seria responsabilidad ante la necesidad de mejorar las relaciones entre la sociedad y su entorno, la maduración de una cantidad considerable de organizaciones no gubernamentales ambientalistas en la región yucatanense, el auge de un importante sector académico dedicado a generar saber en materia de medio ambiente y ecología, la promulgación de la Ley Estatal del Equilibrio Ecológico y la Protección al Ambiente, y la creación del Sistema Estatal de Areas Natural Protegidas, son circunstancias que, sumadas, constituyen un ambiente sumamente favorable para llevar a cabo un esfuerzo intenso de educación ambiental, en muy diversos frentes y dirigido a un universo muy heterogéneo de destinatarios.

De hecho, la Secretaría de Ecología del Gobierno del Estado de Yucatán siempre ha considerado a la educación ambiental como la piedra de toque de su estrategia. Esta aseveración merece una explicación adicional: la estrategia de gestión ambiental que se ha propuesto seguir la presente administración descansa en tres postulados, a saber:

1) Las características ecológicas y la problemática ambiental de la región yucatanense determinan una actitud fundamentalmente preventiva ante el avance del deterioro de las condiciones ambientales. Dado el estado de conservación de los ecosistemas locales, esta actitud preventiva debe estar centrada en acciones de conservación de una muestra representativa de estos ecosistemas, y de promoción del uso adecuado de los recursos naturales que los constituyen.

2) La enorme pérdida de cubierta vegetal que significó para Yucatán el auge de la industria henequenera y la indiscriminada extracción de recursos forestales, la presión a la que han sido sujetas sus poblaciones de flora y fauna silvestres, el manejo inadecuado y la contaminación de los recursos acuíferos regionales, el crecimiento caótico de los centros de población y el

avance incontrolado de la industria pequeña y mediana, han ocasionado un grado de deterioro que, sin ser aún dramático, sí merece la implementación expedita de acciones de carácter correctivo, de restauración de ecosistemas y de prevención y control de la contaminación.

3) A pesar de su evidente importancia, y del esfuerzo que se dedica tanto a las actividades conservacionistas como a la lucha contra el deterioro ambiental, lo cierto es que se trata de una labor de sísifo si no se encuentra sustentada en una profunda y tesonera labor de largo plazo dirigida a modificar las actitudes de la población ante su entorno; esto es, si no se modifican las relaciones establecidas entre la sociedad y la naturaleza. En otras palabras, la clave de la permanencia de los esfuerzos de gestión ambiental radica en el éxito de las labores de educación ambiental.

Las Herramientas para la Educación Ambiental

Una vez determinadas estas tres líneas de acción, resultó necesario determinar, primero, el universo de problemas que ameritaba una aproximación desde la perspectiva de la educación ambiental, y después, el universo de destinatarios a los que merecía la pena dirigirse en el plazo mas corto.

Así las cosas, se ha llegado a la conclusión de que los temas prioritarios para la educación ambiental en el estado de Yucatán son, por orden de importancia, la protección de las riquezas naturales regionales, basada en una relación afectiva y en una propuesta tecnológicamente adecuada de uso; la importancia del manejo cuidadoso del agua, con énfasis en la necesidad de dotar a las viviendas y a la agroindustria de sistemas adecuados de disposición y tratamiento de aguas residuales; las técnicas elementales de manejo de los residuos sólidos, pensando en el hecho de que la geología y los suelos del Estado hacen difícil la disposición final de las basuras; la promoción de una cultura del árbol, insistiendo en las bondades de reforestar con especies nativas; y la incorporación en los planes y programas de estudio de los contenidos formales de la ecología regional.

Por otra parte, en lo que respecta a los destinatarios, nos encontramos ante la difícil situación de que, idealmente, el universo al que nos debiéramos dirigir consiste en la totalidad de la población, incluyendo a la población maya, a pesar de su tradicional apego a la tierra y respeto a los ciclos y flujos de la naturaleza. Esto continúa constituyendo un reto enorme, que no podemos presumir de haber superado. Para poder enfrentarlo, nos hemos visto en la necesidad de sectorizar a los destinatarios, estableciendo vías de acceso a los niños (particularmente através de las estructuras formales de la educación pública), los usuarios de las áreas naturales protegidas (a quienes consideramos un sector prioritario, por razones implícitas en lo expuesto anteriormente), los universitarios (mediante sesiones participativas, al estilo de seminarios y simposia, ademas de poner a disposición de los centros e institutos de educación superior los programas de educación e investigación de las áreas protegidas estatales), y la población abierta (mediante exposiciones itinerantes, materiales audiovisuales y, próximamente, series documentales transmitidas por la televisión local).

Todavía nos falta acceder a algunos sectores de suma importancia, entre los que merece la pena mencionar particularmente a las mujeres, los trabajadores del campo y el mar, los obreros, y los indígenas. Es evidente que la tarea que aun tenemos por delante es enorme.

A pesar de lo anterior, nos anima el hecho de que hace dos años, el Estado de Yucatán no contaba con una sola herramienta ad hoc para llevar a cabo actividades de educación ambiental. Hoy, en un lapso que puede considerarse relativamente breve, hemos logrado crear un paquete didáctico diverso y flexible; y contamos con una cartera de acciones sistemática, y congruente con el resto del programa estatal de ecología, que nos ha permitido sensibilizar a buena parte de la población del Estado, de tal manera que las ideas de conservación, saneamiento ambiental, relación sociedad-naturaleza, y calidad de vida ya no son conceptos propios de unos cuantos académicos, sino parte del discurso cotidiano de cada vez mas yucatecos.

Esta conferencia ha sido para nosotros una oportunidad de oro para someter a crítica una muestra representativa de los materiales que hemos generado para iniciar una actividad sólida de educación ambiental y para explorar nuevas vías a seguir, siempre ciñéndonos a las particulares condiciones ambientales y culturales de nuestro hermoso rincón de México.

ERIC/SMEAC'S TEACHING ACTIVITIES PUBLICATIONS FOR ENVIRONMENTAL EDUCATION

John F. Disinger
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Abstract

Rationales for and development of ERIC/SMEAC's 19-volume series of environmental education teaching activities publications will be presented. Focus will be on selection and design of topics for the individual volumes, and of the activities. Sample activities will illustrate their usefulness as supplementary teaching/learning materials.

In 1973, the Educational Resources Information Center's Clearinghouse for Science, Mathematics, and Environmental Education (ERIC/SMEAC) initiated a series of teaching activities publications for environmental education. The purpose was to help fill the void of such materials confronting elementary and secondary school teachers; commercial or other teaching materials for environmental education were not generally available. Grassroots demand for environmental education teaching materials was vocalized and audible; that is, ERIC/SMEAC was frequently asked by classroom teachers, curriculum specialists, school administrators, nature/outdoor center directors, etc., to recommend such materials, even to make them available--on demand.

Earlier (in 1971), SMEAC had been assigned responsibility by the ERIC system as its clearinghouse for environmental education. Part of SMEAC's task was (and still is) to collect, describe, and disseminate printed educational research and resource materials in its mission areas--science, mathematics, and environmental education. "Dissemination" through ERIC was (and still is) accomplished primarily by entering abstracts of appropriate documents into the ERIC database, where they are searchable both manually and by computer. Many documents accessed by ERIC were (and still are) available in ERIC microfiche collections around the world, and also may be purchased in paper copy or in microfiche from ERIC. Thus, ERIC serves as an expanding archive, primarily accessible through a combination of library services and computer linkages. Additional materials, including many curriculum documents, are added to the database continuously and routinely.

The ERIC system's first steps are identification and collection--learning what printed research and resource materials in and for education, broadly defined, are available, securing copies, then incorporating them into the system. For environmental education, initial points of contact were the state education agencies--the state coordinators--and the managers of federally supported curriculum development efforts. Primary (but not sole) among the latter in those early days were programs supported by Title III of the Elementary and Secondary Education Act of 1965. Literally hundreds of locally developed curriculum documents had been supported, and most were accessed by ERIC. Since then, a number of additional sources have emerged--other federal agencies, many state agencies, private sector publishers, and local producers and developers.

ERIC/SMEAC has become the possessor of an extensive, continuously growing, collection of environmental education curriculum documents, containing literally thousands of teaching activities--some excellent, some pedestrian, many along the continuum between. Most had been locally designed, or re-designed, or lifted in toto from other sources, for relatively specific local use, and they were packaged and formatted in as many ways as there were packagers and formatters.

SMEAC's next step was to attempt to meet demand for environmental education teaching materials by carefully selecting appropriate printed activities and information from the collection, then re-writing, re-packaging, and publishing them (i.e., disseminating them in the traditional manner). To accomplish this, it was necessary to conceptualize an organizational scheme, determine criteria for selection, establish quality control procedures, and develop common formats. Since the beginning, the intention has been to furnish supplementary materials for infusion into existing curricula; there has been no attempt to produce packaged curricula or programs.

Selected as the framework was Roth's list of 111 concepts for environmental management education (Roth, 1970), which had been developed earlier as a comprehensive list to characterize the field. SMEAC's 1973 teaching activities effort provided a set of activities across the K-12 spectrum, for the standard curriculum areas. Efforts were made to include as many of the 111 concepts as possible (many activities were classifiable under more than one concept), to span as many environment-related topics as possible. The producers of this collection, both members of the Ohio State University faculty, re-developed the 100-plus activities they had selected from the ERIC database into a common (and common-sense) format, also paying due attention to clarity and other niceties of presentation. However, little effort went into "gloss." Activities were selected from a wide range of sources, properly referenced so that users of the volume could "track down" additional activities from the same sources, through ERIC or otherwise, if they wished to do so. The developer of each source document was contacted for permission to include its materials in the ERIC publication. Activities were tested in local classrooms.

Similar procedures were followed for two additional volumes, in 1974 and 1975. At that point, a decision was made to develop future volumes on specific topics of concern; ultimately, the scope of environmental education is too broad to treat it adequately across the board. Thus, in 1976 volumes focussing on energy, urban environments, and population education were developed and published.

Since 1973, 21 environmental education teaching activities publications have been published by SMEAC. SMEAC has also become involved in the development of teaching activities volumes for science education. All of SMEAC's teaching activities volumes are in the ERIC data base, available through ERIC microfiche collections, and also available for purchase in printed form from SMEAC Information Reference Center.

Most of the environmental education volumes were developed "in-house," from materials already in the ERIC database and with OSU faculty as conceptualizers/authors/compilers/editors. In several cases, OSU graduate students contributed significantly, and in some others "outside" experts worked with SMEAC staff as authors. Four of the volumes were developed completely externally, but with substantial SMEAC input. All but one of the volumes is targeted solely on grades K-12. In each case, Roth's list (sometimes modified to fit the specific topic) provided the conceptual frame.

The appendix to this paper lists the 21 environmental education volumes produced to the present, arranged by date of publication. Scrutiny of the chronologies reveals that topic selection generally foreshadowed the emergence of publications from other sources dealing with "hot topics."

Demand has been strong. Between December 1989 and April 1990, more than 1500 requests for free copies of the 1978 "Recycling" volume, and approximately 3000 requests apparently associated with Earth Day 1990 programming, were recorded by SMEAC. However, complimentary copies are not available, since clearinghouse publications activities are not supported by contracts with the U. S. Department of Education's Office of Educational Research and Improvement. However, purchasers are free to duplicate, on their own, individual activities or entire volumes. SMEAC hopes to learn about such distributions, to determine actual usage and as input for making decisions regarding continuing efforts in the publishing of teaching activities volumes.

Reference

Roth, Robert E. 1970. *Environmental Management Concepts-A List*. Madison, WI: University of Wisconsin Center for Cognitive Learning, Technical Report No. 126. ERIC ED 045 376.

Appendix: ERIC/SMEAC EE Teaching Activities Publications

All entries in the series, listed below, will be presented and discussed at the scheduled conference session.

John H. Wheatley and Herbert L. Coon, *100 Teaching Activities for Environmental Education* (1973, ERIC ED 091 172);

John H. Wheatley and Herbert L. Coon, *Teaching Activities for Environmental Education, Volume II* (1974, ERIC ED 102 031);

John H. Wheatley and Herbert L. Coon, *Teaching Activities in Environmental Education, Volume III* (1975, ERIC ED 125 868);

Herbert L. Coon and Michelle Y. Alexander, *Energy Investigations for the Classroom* (1976, ERIC ED 130 833);

Herbert L. Coon and Mary Lynne Bowman, *Environmental Education in the Urban Setting: Rationale and Teaching Activities* (1976, ERIC ED 137 140);

Judith M. Schultz and Herbert L. Coon, *Population Education Activities for the Classroom* (1976, ERIC ED 141 178);

Robert H. McCabe and others, *Man and Environment Teaching Alternatives* (1977, ERIC ED 144 826);

Herbert L. Coon and Charles L. Price, *Water-Related Teaching Activities* (1977, ERIC ED 150 026);

Mary Lynne Bowman and John F. Disinger, *Land Use Management Activities for the Classroom* (1977, ERIC ED 152 541);

Mary Lynne Bowman and Herbert L. Coon, Recycling: Activities for the Classroom (1978, ERIC ED 159 075);

William R. Hernbrode, Multidisciplinary Wildlife Teaching Activities (1978, ERIC ED 162 897);

Herbert L. Coon and Mary Lynne Bowman, Energy Activities for the Classroom, Volume II (1978, ERIC ED 173 072);

Mary Lynne Bowman, Values Activities in Environmental Education (1979, ERIC ED 182 118);

Charles F. Roth and Linda G. Lockwood, Strategies and Activities for Using Local Communities as Environmental Education Sites (1979, ERIC ED 194 349);

Mary Lynne Bowman, Teaching Basic Skills through Environmental Education Activities (1979, ERIC ED 196 704);

Mary Lynne Bowman, Teaching Natural Resources Management through Environmental Education Activities (1981, ERIC ED 214 752);

Lori D. Mann and William B. Stapp, Environmental Education Teaching Activities for Global Education (1982, ERIC ED 229 214);

John F. Disinger and Marylin Lisowski, Teaching about Hazardous and Toxic Materials (1985, ERIC ED 273 432);

John F. Disinger and Marylin Lisowski, Teaching Activities in Science/Society/Technology/Environment (1986, ERIC ED 282 711);

Robert W. Howe, Terry L. Wilson, and John F. Disinger, Environmental Education Activities for Teaching about Hazardous Materials in the Home (1988, SMEAC SE 050 065);

Robert W. Howe, John F. Disinger, and Staff, Environmental Activities for Teaching Critical Thinking (1990, SMEAC SE 051 336).

AN ENVIRONMENTAL EDUCATION COURSE FOR WISCONSIN TEACHING CERTIFICATION

Dr. Carl D. Finstad
University of Wisconsin-River Falls
River Falls, Wisconsin

Abstract

Challenge: can one course incorporate undergraduate and graduate students majoring in Early Childhood, Elementary Education, Agriculture, Science and Social Science meet the Wisconsin teaching certification standards? A course designed and taught at the University of Wisconsin-River Falls to accomplish this objective is described.

It became law in Wisconsin that effective 1 July 1985 all graduates receiving teacher certification in Early Childhood, Elementary Education, Agriculture, science, and social science were to have had a course in environmental education. The University of Wisconsin-River Falls grants certification in all of these, so our problem was somewhat unique and formidable. In the initial stages of discussion as to how this requirement would be met at our institution it was determined that one course was to be develped applicable to all areas affected, both undergraduate and graduate. It was also determined the course would be jointly offered from the three academic departments that had offered a course which met the prior conservation requirement--Biology, Geography, and Resource Management. A committee was formed consisting of a representative from each of the affected departments; I was the Biology representative. This committee was assigned the responsibility of developing a course which would meet the standards specified by the state Department of Public Instruction.

The law identified seven "competencies" which were to be incorporated into the course. Four of the competencies are content oriented and the last three, of which number six has five separate components, are pedagogical. Through various circumstances final development of the course which was to be identified as Environmental Education became my task. A 1985 summer non-teaching grant afforded me the time and opportunity to accomplish it. By good fortune I chanced upon a textbook which ideally suited the content competencies but the pedagogical competencies seemed to defy resolution. How was I to incorporate into one course pedagogy which would meet the needs of the widely varied student population we might have in a single class? Again, I chanced upon what would eventually be the solution to my problem--Project WILD. although it seemed to present the solution to my dilemma one important question remained--how could I get a copy of the guide? Contact with the state Department of Natural Resources, the agency in Wisconsin which controls Project WILD, revealed there was a workshop scheduled in August which if I attended I would become a facilitator and would receive both guides, the elementary and secondary. I did attend the workshop and became a facilitator, thus I decided to incorporate the Project WILD workshop component into the course so each student would receive the guide suitable to their area, elementary or secondary. Subsequently, I became an Aquatic WILD and Project Learning Tree facilitator, as well, and now incorporate all three into the course. These three (Project WILD, Aquatic WILD, and Project Learning Tree) represent a combined total of approximately 200 environmental education activities.

I designed the course to consist of a lecture and laboratory component. Initially, the laboratories are primarily field trips to acquaint students with basic ecological principles. As we progress Project WILD, Aquatic WILD, and Project Learning Tree activities are incorporated into the laboratory component. Later field trips relating to the "built" environment are also incorporated, so laboratories become a mix of activities from the guides and field trips. Once we receive the guides students segregate into groups of three or four of related certification (Early Childhood, Elementary Education, etc) to develop the pedagogical requirements. finally, detailed oral reports are given by each group, relating how they will incorporate environmental education activities into the grade level and subjects they expect to/do teach (some graduate students are teachers) for each pedagogical competency. Most of the activities reported are from the guides but at that point many are looking into other resources for activities and some have the confidence and expertise to develop their own.

The Wisconsin Department of Public Instruction followed the environmental education requirement for teacher certification with a mandate for the public schools. It was that every school district in the state was to have an integrated K-12 curriculum, incorporating environmental education into every subject offered by the 1988-89 school year. Thus, our graduates have a wealth of resources to teach environmental education and are also knowledgeable of how it can be integrated into the various grade levels and subjects from the oral reports they've heard from other grade levels/disciplines.

STORYTELLING: KEEPING OUR ENVIRONMENTAL HERITAGE ALIVE

Earl Gardner
Mary Lou Meadows
University of North Alabama
Florence, Alabama

Abstract

Participants will demonstrate knowledge of how environmental stories can awaken environmental conscience and foster empathy, concern, and caring for the earth. The session includes: How storytelling can enhance the environmental curriculum, tips on telling environmental stories to any age group, and stories related to specific environmental issues of the 1990s.

Meeting the environmental challenges of the 1990s will require all to seek new methods and techniques. Indeed many will forge ahead with innovative and creative educational ideas that will bring us closer to our goal of a pollution-free world. However, in our search of the latest findings we should not forget that some old tried-and-true methods will forever be effective and should be revitalized and used over and over again.

One such method is storytelling. Until recent times, culture and values were passed down from generation to generation by three institutions--family, church and school. Today, with families scattered across the map, the heritage and tradition that bound families and communities together are being lost. This loss of a sense of heritage and tradition may be a contributing factor to the environmental problems we are facing today.

It is perhaps the need to capture and preserve this heritage that has resulted in the surge of popularity now being enjoyed by storytelling. Festivals abound and storytellers crisscross the nation, holding audiences entranced with folktales and other stories which reflect the beauty and diversity of our country through their subjects, narration, and dialect. (Dezell, 1989)

Through incorporating stories to teach environmental education we can plant the seeds for change because we help create and change the conditions of our lives with our words. Changes in attitudes and behavior are what we must have in order to meet the awesome challenge that is before us.

Lutts (1985) in elegant simplicity reiterated the value of stories with the following statement:

Stories can be powerful things. They give shape to our reality...and that,

> The key to recognizing the environmentally wise stories lies in recognizing that people and nature are parts of the same thing, in place and in time. The tongue for telling them may lie in the combination of environmental education and local and regional studies; and in a collaboration of local education centers, schools, historical societies, and other cultural institutions.

Why Storytelling?

Everyone loves a good storyteller. No one ever grows too old to enjoy a well-told story. It is an especially useful tool with young and older audiences since it frees the hands for gesturing and illustrating. More important, it permits one to maintain eye contact which makes the audience feel that the story is being told especially for each individual.

The environmental curriculum lends itself naturally to storytelling. Environmental education is about caring and nuturing, and preserving of the earth and in turn - all of us on the earth. In this vein, storytelling is a natural avenue for promoting the preservation of the earth.

How to Tell a Story

Choose a physical setting that is both comfortable and relaxing. Everyone should be close enough to hear well and see gestures and facial expressions.

Select for telling only stories that you as a teller particularly enjoy. If the story does not feel right to you, it will be difficult to make it seem real to the listeners.

Don't just memorize the story. It will seem cold and static to the listeners if it is obvious that you are merely relaying memorized words.

Visualize the characters and setting of the story. Think of words that will convey that visual image to the listeners. People love images and often conjure up their own images to add joy and peace to their lives. (Petty, Petty, and Becking, 1985)

Embellish the story with exciting colorful language that describes the plot, characters, and mood of the story. Phrasing and tone of voice should be as carefully chosen as the correct words.

Tell your stories as often as you can. A good story can be retold again and again, even to the same audience. Retelling will boost your self-confidence and provide others with the dynamic power of the told story. (Young, 1989)

Find your own style. Some stories are humorous and some are solemn. There is room in the world for all kinds of stories and styles of tellers. If your personality is not suited to a frivolous story, stick with the stories that are more serious.

Stories are Everywhere

Everyone has a story! Family reunions are replete with often repeated stories of family members' escapades. Personal experiences are repeated in homes throughout the world, usually with the phrase "guess what happened to me today." All of these episodes have the potential of becoming classic stories that teach, admonish, or entertain.

Published stories may be told. If the story is from a published source, always give credit to the author and the publication from which it came. Remember, you can change the wording and embellish the story to fit your own style as long as you inform your listeners that this is your rendition of a story by a certain author.

Our own experiences are valid enough for a story. So, let yourself go, and share "the heart of human experience." For example,

> I had had enough! Enough of the telephone, the deadlines and the endless rhetoric that goes on in the name of intelligence in a university. I walked to my car with my briefcase full of papers to grade and my mind full of contempt and loathing for the confinement that I had felt on this beautiful spring day. A bluebird swept gracefully down in front of me to retrieve a large piece of round plastic that had probably been carelessly dropped by a student on the way to class. The bluebird boxes had been put up around the campus several years before in an effort, which was successful, to save these beautiful birds from extinction in the Southeast.

I watched as the bird landed skillfully on the perch and attempted to enter the small hole with the treasured nest building supply that had been so lovingly gathered. Try as he might, the bird could not bend, tug or pull at the plastic hard enough to pull it through the tiny hole. Finally, he gave up and let the round piece of plastic fall to the ground. I walked over and picked up the now useless piece of pollution and put it in my pocket. My plan was to deposit it in the correct recycling receptacle where it could be reused. While driving home, I felt the plastic in my pocket and I thought about how some careless person had left the bluebird with something that he could not use. But the bluebird, with nature's wisdom, knew what to do. When he found something for which he had no use, he simply had to let it go. And that is exactly what I did with that briefcase full of papers--until Monday morning.

Summary

How do you develop environmental values through storytelling? Anyone can become a storyteller by remembering the following:

* the appeal of storytelling is universal, everyone loves a good story;

* carefully look for appropriate stories that enhance empathy, concern, and caring for the environment;

* after you have learned the basic plot of your story, visualize the images and relay those images in colorful language to your audience;

* jump in and start telling. Everybody is a storyteller!

With environmental stories, we can help people discover answers to the problems of our day by sharing environmental stories from our hearts: stories to awaken environmental conscience; to foster empathy, concern, and caring for the environment; and to help people see and build a better world. (McCormick, 1990)

"HANDS-ON ENVIRONMENTAL EDUCATION": UTILIZATION OF NATURE CENTERS

Cindy Giedraitis
Austin, Texas

Nature Centers offer opportunities to learn about the environment by utilizing hands-on programs, exhibits and nature trails. Find out how you can apply these activities to your special needs in or outside your classroom.

IMPROVING WRITING AND THINKING SKILLS IN ENVIRONMENTAL STUDIES THROUGH APPLICATION OF "WRITING ACROSS THE CURRICULUM" APPROACHES

Thomas R. Hudspeth
Burlington, Vermont

Application of "Writing Across the Curriculum" approaches to a Senior Seminar in Environmental Studies to improve writing and thinking skills. Illustration of approaches utilized and improvements noticed. Consideration of ways these approaches serve as a model for our fields, for "Environmentalizing Across the Curriculum".

TEACHING FARMS--A POWERFUL ENVIRONMENTAL EDUCATION FIELD EXPERIENCE

Eric Jorgensen
San Jose, California

Farms, by definition, are manipulative, interactive places tying urban lives to the resources of the earth. This presentation illustrates the power of farms as an environmental education laboratory, examines curriculum guidelines and sources, and presents a teacher survey on farm environments.

A CURRICULUM FOR A MIDDLE SCHOOL ENVIRONMENTAL AND OUTDOOR EDUCATION COURSE

Nestor Kelba
Ron Sweet
Calgary, Alberta, Canada

"Environmental and Outdoor Education" (grades VII, VIII, IX) has been developed by a school board for a provincial Department of Education. This course has equal status with music, shop, etc. It will be implemented in 600 schools in 1990. Three strands, Environmental, Personal/Group, Outdoor, move students through three experiential levels: Foundations, Exploration and Empowerment.

USING MAGAZINES FOR EE

Randy L. Kilian-Smith
San Antonio, Texas

How to use NW Magazine formats which target environmental issues in such a way that affective learning in the environment/e. science content area can be enhanced.

SOLID WASTE MANAGEMENT EDUCATION- FLORIDA'S 4Rs PROJECT

Roy I. King
Florida Department of Education
Tallahassee, Florida

Linda Cronin-Jones
University of Florida
Gainesville, Florida

David LaHart
University of Central Florida
Cape Canaveral, Florida

Florida's 1988 Solid Waste Management Act mandated the Department of Education develop Florida-specific, K-12 instructional materials on solid waste management. Approximately 100 supplementary, interdisciplinary activities correlated to Florida's Minimum Student Performance Standards and Standards of Excellence recently were distributed to the schools. Sample activities and ordering information will be available.

WET-WATER EDUCATION FOR TEACHERS

Emily B. King
Kansas State University
Manhattan, Kansas

Youth can influence their families' water useage habits and learn to make sound decisions regarding water policies in communities. This "hands-on" workshop provides teachers and youth leaders the basic background and skills necessary to conduct curriculum based lessons. Content includes water cycle, supply, treatment, conservation and pollution.

TEACHING FOR RESPONSIBLE ENVIRONMENTAL ACTION: ARE WE BRAINWASHING OR EDUCATING OUR STUDENTS?

C. E. Knapp
Northern Illinois University
Oregon, Illinois

Abstract

Many environmental educators want their students to have the same values as they do. They think they have found the direct pipeline to the truth. This view of teaching could be turning off students to environmental lifestyles. We will take a look at our values and methods to decide if we are educating or brainwashing.

During the last decade, environmental educators have made significant progress in clarifying the goals and objectives in their field and in defining environmental literacy. They have also learned more about writing and implementing various instructional materials for influencing environmental values. Despite some disagreements about how to get the job done and whether or not the efforts have been successful, they all believe that our survival depends upon the nature of the value systems people hold and the lifestyles they choose to live.

Naisbitt and Aburdene (1990. p. 267) predict that "...all countries will have to allow an increasing place for values and ethics in the school curriculum."

Few people would argue that one important goal of schooling is to prepare students for roles as responsible citizens. Environmental educators generally agree that student skills for deciding about the use or nonuse of natural resources are worthy instructional goals. However, they differ on how the term "responsible action" is operationally defined and what student behaviors are appropriate at various grade levels. Despite this disagreement about the environmental actions that constitute responsible behavior, most educators believe that part of the instruction must be directed toward influencing student values. The New York Times, quoting Lester Brown's State of the World Report, confirmed this belief: ". . .movement to a lasting society cannot occur without a transformation of individual priorities and values..." (1990. p. 19)

During the past decade, environmental educators have debated the question of which values education strategies are effective. Curriculum developers have produced a variety of teaching aides to assist teachers in environmental values education. Some leaders advocate inculcating (sometimes viewed as a mild form of brainwashing) or "treading on" students' values, (from the Latin, "inculcare"), in order to lead them to a set of predetermined environmental values considered to be right and good. Others advocate educating or "drawing out" the students' values, (from the Latin, "educare"), by presenting an array of environmental lessons to help them arrive at their own understanding of what is right and good. Some believe that values are influenced mainly by affective means and others believe that they are influenced mainly by cognitive means. This debate will probably continue until further research reveals more definitive answers on how to influence values that result in a sustainable, global ecosystem. To define the situation more realistically, the differences of opinion revolve around determining the proper balance between methods and materials designed to inculcate and educate student values.

Perhaps the methodology issue can be illustrated best by creating a "values strategy continuum," with the words, "inculcating" at one end and educating" at the other. For each position along this continuum, various values education strategies and curriculum materials are available for use. These are labeled inculcation, values clarification, cognitive moral development, values analysis, action learning, and confluent education. Although all environmental educators don't agree upon the labels and the values activities sometimes do not fit neatly in only one of these categories, this classification system has proved to be useful.

Value systems often guide our daily behavior. They are composed of clusters of values dealing with the same topic (i.e., acid rain, global warming, or toxins). These values are learned from the various aspects of the culture-

-beginning with influences in the family and community and extending to others in our immediate area, nation, continent, and, in some cases, the world. Each value is composed of a set of related attitudes and beliefs about concrete or abstract objects or ideas. Beliefs that can be verified as true through experience or other means, have been classified as knowledge. Values are both personal and societal standards that represent desireable moral or nonmoral goals. For example, a person may value getting up in the morning to go to a factory job to earn money. Achieving economic gain may be the primary value motivator. Perhaps a secondary motivator is the desire to be with friends at work (a social value). Getting up to earn money, even when tired, feeling ill, or wanting to be alone, is easier when economic values are prioritized over other values such as sleeping in (convenience/comfort), giving in to illness (health/safety), or wanting to be alone (privacy). Further down the list of motivating values may be the desire to go to a beautiful area (aesthetic) and to help improve the ecosystem (ecological), but they don't always play a direct role in motivating behavior. Sometimes we are able to clearly identify the primary and secondary motivating values that guide our actions. We also realize that other values can operate within when we choose to behave in particular ways, but they may be more difficult to identify. Identifying motivating values that determine behavior is a skill that can improve with knowledge, structure and support. The following diagram illustrates the hierarchy of values in the examples above:

Going to Work to Earn Money

Economic
Social
Comfort/Convenience
Health/Safety
Privacy
Aesthetic
Ecological

On another day, the desire for privacy and aesthetic values may take priority over all others and the same person may choose to get up and go walking alone in a beautiful area. The arrangement of personal values would then change:

Walking Alone in a Beautiful Area

Privacy
Aesthetic
Comfort/Convenience
Health/Safety
Social
Economic
Ecological

Because these diagrams resemble a young child's stack toy, this model is described as the Stack Toy Values Model. It can be useful in helping students identify their motivating values and in helping teachers conceptualize instructional approaches for influencing values. In the examples provided, ecological values ranked at the bottom of the hierarchy in each case. If that same person decided not to go to work that day and knowingly lost a day's pay in order to participate in an organized demonstration against a polluting automobile industry, the ecological values would move to the "top of the stack." In less dramatic ways, ecological values can shift toward the top by car pooling to work, taking a minimally packaged lunch, or voting to ban smoking in the work place. The Stack Toy Values Model can be viewed as a dynamic and theoretical paradigm composed of constantly changing hierarchies of values. Sometimes individuals are consciously aware of the arrangement of the important motivating values that guide personal behaviors and sometimes they are not.

This workshop will explore various approaches to environmental values education and identify them using the "values strategy continuum." It will also elaborate upon the Stack Toy Values Model and consider its advantages and disadvantages. Assistance will be offered in defining the role of the teacher in dealing with controversial environmental issues and in providing sources of further reading on the topic.

References

Naisbitt, J. and Aburdene, P. (1990). Megatrends 2000: Ten new directions for the 1990s. New York: William Morrow and Company, Inc., p. 267.

Shabecoff, P. (February 11, 1990). "40-Year countdown is seen to rescue the environment." The New York Times, p. 19.

MIDDLE SCHOOL STUDENTS AND ENVIRONMENTAL EDUCATION: A LOGICAL PAIRING

Christine Lalonde
Oklahoma State University
Stillwater, Oklahoma

Research and current learning theories suggest that middle-school students respond to interactive, self-directed learning approaches. Environmental education, interdisciplinary in nature, lends itself to these learning styles. This presentation will discuss the questions and concerns one would encounter in developing an environmental education program to be used with middle level practitioners.

BRINGING ENDANGERED SPECIES DOWN TO EARTH

Richard A. Larson
Colorado Division of Wildlife

Peggy Millett Zemach
Denver Museum of Natura History
Denver, Colorado

Peregrine Falcons: The Path to Recovery, a teacher resource packet, was created by individuals from agencies, school districts and organizations. This curriculum packet not only emphasizes endangered species, but connects urban areas in the temperate zones with global change issues such as deforestation and species extinctions. This presentation willfocus on the design, development and implementation of this successful curriculum.

ENVIRONMENTAL FOUNDATIONS: A TEN YEAR PERSPECTIVE

Charles W. Lee
Robert J. McCallum
William Paterson College
Wayne, New Jersey

The college's Environmental Foundations course serves as a general education course for non-science majors and introductory course for majors. Despite numerous changes, the team taught, multidisplinary format has become institutionalized. Unlike other similar courses, it involves workshops that have been developed by our faculty. The presentation focuses on the unique attributes, strengths and weaknesses of both the lecture and workshops.

ALABAMA PHOTOVOLTAICS EDUCATION PACKAGE

Bernard M. Levine
University of Alabama in Huntsville
Huntsville, Alabama

Abstract

Alabama distributed Photovoltaics Education Packages to its schools at token cost. Most of the packages contain a ten Watt solar panel, a manual containing student experiments, and a demonstrator. Solar electricity is converted into sound, light, and shaft rotation with electronic control. It's used to power elementary school experiments.

The Alabama Course of Study requires the teaching of the uses of solar energy in Kindergarten (Life Science); the effects of pollution and of energy from the sun in the 1st grade (Life and Earth Science); and more about pollution and of heat and light in the 2nd grade (Earth and Physical Science). These concepts are identified throughout the K-8 Courses of Study for Science and Social Studies (e.g. Environment, Energy Resources, Pollution, Global Issues, Current Events). After the expiration of federal and Alabama tax credits for solar energy systems on December 31, 1985 and the virtual collapse of instate solar industry, the Alabama Solar Energy Center at the University of Alabama in Huntsville (UAH) decided to develop hands-on science learning materials which might have the result of educating a better informed generation of prospective conservers and consumers.

An early attempt at such activities, Electricity from the Sun, directed the high school teacher to purchase a "small solar cell with matched DC motor, battery radio, voltmeter and flashlight bulb." The teacher was directed to one of several sources from which to purchase this small solar cell and the teacher's probable cost for sufficient output power to run the radio would have been $25. Amorphous crystalline cell sections were described which could be connected in series and/or in parallel to determine how the resultant voltage and current levels would change (i.e. connect cells in series to increase voltage; in parallel to increase current).

In 1988 UAH received a donation of nearly one hundred 10 Watt solar panels from the NASA Jet Propulsion Laboratory with the provision that they be used for educational purposes. This gave us the opportunity to package large solar panels, demonstration devices, and nicely. We will use extensively next year during our module on energy".

9th Grade Science "In a relatively new industry, it is extremely good for students to participate in PV demonstrations. The finite quantity of fossil fuels underscores the need for this kind of awareness. Recommend expanding material on logic chips and solderless breadboard."

H. S. Electronics "The students, as well as myself, have enjoyed the demonstrations. Thank you for making this equipment available to us".

Grades 8-9 "This equipment is a very useful window on the future. The radio won't work very well."
Industrial Technology II-9th Grade "Received the PEP too late to use in this year's program but have reviewed manual and demonstrator and plan to use extensively next school term in Power-Energy Unit".

Grades 5-8 "What we have used has been very helpful. This is the first time most students have worked with solar panels."
H. S. Science "The students were very excited to work with this equipment and anxious to try all the experiments. It is an excellent project".

H. S. Science "This module/materials kit has been a significant and positive learning tool and motivator".
Physics-12th Grade " The PEP package is a very useful teaching aid".

9th Grade Science "I see good possibilities for a 'hands-on' demonstration".

9th Grade Science "Excellent experiments and varied".

9th Grade Science "The module was a good resource by virtue of all necessary materials, handouts, etc. being in one set".

10th Grade Science "My students enjoyed working with this set up. When I used this package with 10th graders, the pictures/circuit diagrams were all they needed. We haven't tried the integrated circuits yet.

5th Grade "Very Superior".

Encouraged by these results, additional funding was provided to revise the manual, offer 40 more complete learning activities and to provide them to schools at low cost. The Alabama Department of Economic and Community Affairs Science, Technology, and Energy Division provided funding to subsidize a portion of the package's developmental cost. The first year, 1988-89, sixty-four Photovoltaic Education Packages (PEP) were distributed to school systems throughout Alabama. Each package contained a solar panel, a classroom demonstrator, and an instruction manual. Each panel was equipped with a fifteen foot cable to allow the panel to lie outside the classroom while the solar electricity which it generated produced observable results inside the classroom.

The demonstrator, constructed by a non-profit firm training workers with special challenges, was equipped with an ammeter, a voltmeter, two incandescent light bulbs, an AM transistor radio, a small DC motor, and a solderless breadboard with microchips and related wiring. These devices could be used to demonstrate energy conversions and electrical circuits as well. The meters could be used to measure the electrical characteristics of the solar-generated electricity or in connection with other laboratory experiments. The manual contained K-12 experiments as follows:

#1 Meter Familiarization, teacher adaptable to grades 4-12.
#2 Effect of Panel Orientation on Electrical Output, grades 2-12.
#3 PV Panel Performance Curve, grades 7-12.
#4 Light to Electricity to Sound--i.e. playing the radio, grades K-12.
#5 Powering Incandescent Lamps, grades 5-12.
#6 Converting Sunlight to Mechanical Energy, grades 5-12.
#7 Learning about Integrated Circuits and the Solderless Breadboard, grades 6-12.
#8 Setting Up an Electrical Circuit, grades 6-12.
#9 Setting Up an Integrated Circuit, grades 7-12.
#10 Examining NAND and AND Gates, grades 9-12.
#11 Converting the NAND Gate to the OR Gate, grades 9-12.
#12 Studying the Behavior of an OR Gate, grades 9-12.
#13 Converting the NAND Gate to an NOR Gate, grades 9-12.
#14 Charging Batteries Using Solar Energy, grades 5-12.

Of 62 evaluation questionnaires sent with the packages, 21 were returned. All of the evaluators rated the packages "Very Superior" or "Excellent". A summary of teacher evaluator comments follows:

H. S. Science "An excellent buy and quite useful in introducing solar technology. The manual is a bit above reading level of most of my students but we will get by packages, and to develop a Photovoltaics Demonstrator Construction Guide (with learning activities for grades 6-12) 48 of which would be packaged with only a solar panel. The solar panels to be used were light-weight panels made in Birmingham, Alabama by an investors'-owned company, the Alabama Power Company. Concurrently, the original 21 evaluators were requested to describe how effective the packages had been during the next school year. Five responses were received as follow:

H. S. Physics "In conjunction with a unit on alternate energy sources, the PEP is used to demonstrate the conversion of solar energy to electricity. It gives some students a hands-on experience with circuits. Manual is easily understood and followed; panel works perfectly. I like the demonstrator's built in safety factors".

H. S. Science " I use to demonstrate photoelectric effect. I rate the components as follows: manual-B; panel-A; demonstrator-A; breadboard/control circuits-B".

H. S. Physics "Class demonstrations show applications of electrical and solar theory (Exp. #1-8). Some students have difficulty interpreting the directions for higher level experiments (Exp. #10-14).

Principles of Technology-Grades 9-12 "Demonstrates solar panels/solar energy".

School System Coordinator "Teacher who used this equipment has retired. The school has been converted to a middle school. The PEP has been misplaced in the reorganization".

There are about 135 school systems in Alabama. Approximately 150 packages have been produced. In May 1990, only about half of these packages have been requested by the school systems. Only two city school systems and three county school systems have requested more than one package. If the evaluators are to be believed and the price (token charge) is right, what can explain the relatively poor response? The author believes that, based on the facts presented herein, the reason(s) for the poor response must be one or more of the following:

(1) incredibly poor publicity.
(2) too many suppliers of similar material.
(3) an unwillingness to enrich textbook content with supplementary material about a non-traditional power source.
(4) school system budgets that allow $500 for software packages but cannot justify $50 for solar energy instruction materials.

(5) an unwillingness to exert the effort required to use the material.
(6) a feeling of inadequacy concerning electrical circuits and solar technology.

It is believed that reasons (5) and (6) singly or in combination are most valid. Letters were sent to every Alabama School System Superintendent and favorable articles appeared in the State Education Department Monthly and the Alabama Science Teachers Association Newsletter (1). There are virtually no other suppliers of a similar package (2). Some teachers (certainly not the majority) may be unwilling to depart from established lesson plans and texts (3). Computer Literacy has received much attention and might more easily find funding (4).

MISSISSIPPI RIVER MONITORING PROJECT

Dr. Marylin Lisowski
Eastern Illinois University
Charleston, Illinois

A special project involved eight high schools in on-site investigations of the Mississippi River. Although the project primarily focused on water quality parameters, the students were also involved in historical, cultural, and literary research about the Mississippi. This session will highlight the project's implementation and research and evaluation procedures.

PROJECT W.I.Z.E.: SURVIVAL STRATEGIES

Donald Lisowy
Bronx Zoo
Bronx, New York

Survival Strategies is a comprehensive life science curriculum program for grades 7-11 which enables students to embark on an exciting voyage of discovery and inquiry into the future of wildlife. Survival Strategies combines both classroom resources and the unique resources of local zoos and other natural history institutions.

WATER SAMPLING LIKE A PRO WITH HOMEMADE EQUIPMENT

Anne E. Lyon
Mark S. McNeely
TVA
Norris, Tennessee

Because professional water quality sampling equipment is often quite expensive, TVA, as a part of its Teacher/Student Water Quality Monitoring Network, has developed two booklets. They teach people how to use professional equipment and make low cost versions. This presentation will focus on how to construct and use pieces of homemade equipment featured in the booklets.

"EMPHASIZING THE "E" IN NSTA'S NEW SCOPE, SEQUENCE AND COORDINATION PROJECT"

Dr. James D. Lubbers
East Carolina University
Greenville, North Carolina

NSTA's project to revamp the 7-12 science curriculum calls for a doubling of the time spent on science and a coordination across disciplines to make science more relevant and applicable to students' lives and to society's problems. It is imperative that environmental issues be incorporated in this new scope and sequence.

NATIONAL WORKSHOPS: THE TROPICAL RAINFOREST EDUCATION PROGRAM (TREP)

Laura K. Marsh
Oakland, California

Abstract

TREP provides intensive workshops to public school and facility educators (zoos, museums, botanical gardens) with current information and reviews all of the available resources for teaching rainforest related issues. This presentation will focus on the best curriculum and materials for grades K-12. Updated information about TREP and rainforest conservation will be provided.

An Introduction to TREP

The importance of rainforest education has increased in the past few years as a vehicle for global environmental education. In response to the increased demand, the Tropical Rainforest Education Program (TREP) was created to provide intensive workshops nation-wide, primarily to public school educators grades K-12. The workshops focus on current information and makes available resources for teaching rainforest related issues. TREP is hosted by major facilities such as zoos, botanical gardens, aquariums, and museums; or school groups, like local science groups, PTA's, local branches of NSTA, or school districts. The workshops take on a variety of forms depending on the needs of the hosting institution and their audience. The program has been operating for about 3 years and has traveled extensively in the U.S., Canada, and recently Venezuela.

TREP also presents a "Living Rainforest" which is currently touring shopping malls in Southern California. The display, put together and staffed by Creations, is a walk through trail surrounded by live plants, birds and reptiles found in the tropics. The plants and animals are donated from local breeders and nurseries to encourage direct community participation. The tour guides take small groups of children and adults who visit the mall into the "forest" to discuss why rainforests are important, why we need to save them, and how they can actively become involved in conservation. The display has a poster group set up to answer questions and give further information about rainforest destruction and ecology. Two videos, Rainforest Rap (WWF-US) and Our Threatened Heritage (NWF) are shown continuously. A kiosk with information on TREP, the local museums, zoos and organizations who work on rainforest conservation stands nearby. The display stays between two weeks to one month in any location. So far, there has been tremendous media response (local newspapers, the LA Times, radio and television), and school response for field trips. This kind of hands on community involvement in conservation education is very important because it reaches an audience that might otherwise be missed.

The challenge of a national workshop has spurred the development of a program that has long term uses for the schools and community. The goal of TREP is to provide information to the teachers by way of accurate data taken in the field; case studies of political, social and economic status' of the countries in question; and the direct connection that rainforests have to everyday life. Environmental education needs to be one of the basic building blocks of education in our "moder society." The use of rainforests as a means for addressing issues such as personal consumption, recycling and perceptions of one's personal and global environment is quite effective. There are many tools and tricks for getting millage out of rainforest issues that can be used for all ages in the classroom.

Tools and Tricks

Students need the opportunity to become intimately involved with the issues surrounding rainforests. By placing them directly into the ecosystem, with examples of how it relates to their everyday life, the attachment process can begin. The following are some "tools and tricks" for involving students in rainforests.

1. Immerse and involve them in the forest. One example that TREP uses in it's slide show is an imaginary walk through the bathroom. "What is a rainforest like? Well...imagine taking half a hectare (1.25 acres) of rainforest and putting it into your bathroom at home. There would be about 100 different kinds of plants, some tall ones, some hanging from the ceiling and shower curtain, and some with flowers; you would need two space heaters turned on; a troop of about 10 monkeys; 6-8 different species of birds; 200 species of insects; 4 kinds of fish swimming around in the tub; a frog or two; and maybe a snake. O.K., now, turn on the shower full blast and stand under it for about 10 minutes. That's sort of what it's like to be in a tropical rainforest."

2. Don't be afraid to "wod" them with diversity. The numbers of species per hectare in the tropics is staggering and should be used to the educators advantage. It is important to use examples that discuss endemic species, those species which are found only in a particular geographic region and newhere else in the world.

3. Don't be afraid to give them cute. A great tool for working with students is showing them all of the cute, beautiful, unusual, or exotic creatures and plants that live in the forests.

4. Don't be afraid to give disturbing facts. There are plenty of disturbing facts about deforestation rates and numbers of species disappearing before our eyes. Students need to hear the horrifying as well as the wonderful about rainforests. Some educators feel that students (and people in general) are becoming so overwhelmed with damaging facts that they are responding with cultural paralysis and indifference. However, if the facts are presented in context with the value of the forests and ways the students can become involved with their preservation, the facts can act to spur action instead of hampering it.

5. Provide clear examples and interesting facts. Be detailed in your presentation of facts. Stories about the interconnectedness and interdependency of species works well.

Discussions involving in-depth looks at a group of species can be followed by asking what happens when any of the creatures are removed and the effects of their removal on all of the other species.

6. Don't be afraid to provide conflicting information. As educators we have a responsibility to tell both sides of a controversy, yet provide concrete facts about the trends and why it is important to heed warnings. A prime example of controversy is global warming. One side believes we do not have enough data to confirm trends, and the other side pleads that immediate action be taken. Conservation biologist David Eherenfield gives this example about the greenhouse effect: "When scientists state that the chance of a catastrophic global change is greater than 50 percent, they explain that they are making a professional judgement. For example, no one would board an aircraft judged to have such a likelihood of problems and would be reluctant even if the airplan had only a 5 percent chance of failure." Encouraging students to look at the whole picture before they make decisions to support or refute arguments is particularly important in environmental education.

7. Never discuss issues in terms of absolutes. Sustainable development in tropical countries should not be taught as the definitive answer to saving rainforest. Although sustainable agriculture and other development is important in the future of rainforest conservation, it is not the definitive solution. Take for instance a study done on wild harvested fruits in thee Iquitos region of Peru. It showed that this assumption may be over optimistic. Of the 193 fruit species regularly consumed in the area, 120 are exclusively wild harvested while another 19 originate from both wild and cultivated sources. Half of the venders in the markets sell wild harvested fruits. In the last few years the availability of the more popular fruits, such as the aguaje (a palm fruit used in ice cream), has decreased noticeably. The reason for this decline is the method of harvesting has shifted with the increased demand. Originally, the fruit was harvesting by climbing up into the trees and picked. Now, they simply cut the entire tree down. Since the trees are dioecious, the swamps where they grow are filled with groves of useless male trees. Fruit tree harvesting is not regulated, and a potential international market is lost. As so often seems to be the case, the most severe problems for tropical forest

management and long term utilization are not biological, but social and political.

8. Shift the focus. Is the world merely comprised of "natural resources" meant for human consumption? This is a question educators can ask to shift the focus of conservation efforts. The preservation of wilderness as a "resource" semantically allows humans to believe that the forests are for human "use," generally economically, in one form or another. Part of teaching how to act based on caring must come from knowing how to protect without consuming.

Moving On

Educators and students often wonder if there is a "right" age for activism. There seems to be a mythology among students of almost any age, that they are only kids and have no real voice in society. Somewhere in their cultural up bringing they have been taught that only teachers (at school) and politicians (for the world) have any real power. This, of course, is simply not true. Students have to learn that they are not powerless, and that what they do in their daily lives very much affects the whole planet.

What's being purchased, how often, who the manufacturer is, where it was purchased can be a very important place to start as a classroom lesson on rainforest conservation. One idea is to ask the students to go to the grocery store with their parent. Emphasize that the trip should be routine weekly or monthly purchases. As an assignment, ask that the students take an inventory of all of the items purchased. The different vegetables, packaged foods, cosmetics, paper products, and so on should be categorized by type. When the class brings their lists in the next day, ask for several to read their lists out loud. Make comparisons of common items. Next, ask the students to research their products. Where do they come from? Who grows them? What country does the product originate from? What are the materials used for packaging? Are they reusable or recyclable? What companies make the items? Were the groceries taken home in paper or plastic or a reusable bag from home? Have each student present these reports to the class. Follow up with a discussion of which products could be substituted to be a more environmentally safe product, the different uses for left over packages, what companies are doing other types of environmental destruction, either for their product directly or for joint products, and other related questions. Discuss easily available alternatives to the "regular" fare, like recycled toilet paper, string grocery bags, and cloth diapers. Ask your students to go home and discuss these results with their parents. Allow them to make shopping recommendations to the parents that include more conscious buying. Further follow up would include asking the students to inventory the groceries a month after this exercise, and to compare the changes in purchases, if any.

A MODEL ENVIRONMENTAL HEALTH EDUCATION FIELD LABORATORY

Shirley L. Morgan
East Tennessee State University
Johnson City, Tennessee

The purpose of this study was to design a model field laboratory for use in environmental health education as a means of curriculum enrichment. The specific objectives were as follows:

1) to design the field laboratory including supportive facilties;

2) to summarize the unique features of the teaching stations--air pollution, water supply and pollution control, solid waste management and ecological communities;

3) to describe the learning activities included in each teaching station for the appropriate grade levels.

THE SPECIAL IMPORTANCE OF EDUCATION TO THE CONSERVATION OF UNPOPULAR ANIMALS

Patricia A. Morton
Bat Conservation International
Austin, Texas

Popular animals frequently garner the majority of public interest and support. This paper will discuss why some animals are popular and others are not, and present a strategy educators can use to develop understanding, even enjoyment, for little known and unappreciated animals that need to be included in direct conservation planning.

ENHANCEMENT OF COGNITIVE AND AFFECTIVE DEVELOPMENT IN ENVIRONMENTAL AND OUTDOOR EDUCATION THROUGH THE USE OF COMPUTER SIMILATIONS

Dr. Rick Mrazek
Scott Erickson
The University of Lethbridge
Lethbridge, Alberta, Canada

This session focuses on how one can enhance cognitive and affective development in teaching aquatic pursuits through the use of Hypercard programming. In this case the teaching of SCUBA in senior high school programs in Alberta, Canada serves as a model.

HABITAT 2000: A PROGRAM INVOLVING YOUTH IN WILDLIFE EDUCATION

Luba Mycio-Mommers
Canadian Wildlife Federation
Ottawa, Ontario, Canada

Created by the Canadian Wildlife Federation (CWF) and launched in April 1989, Habitat 2000 is a youth education program designed to involve students in "hands-on" wildlife conservation and environmental projects. Annual teachers' project kits will focus on conservation themes. This year's theme "Local action brings worldwide results", features sustainable development.

LEADERSHIP IN SCHOOL SCIENCE AND NATURAL HISTORY

Maureen Oates
Maine Audubon Society
Falmouth, Maine

Peter Corkoran
Swarthmore College
Swarthmore, Pennsylvania

A review of a National Science Foundation Leadership Institute to train twenty lead teachers to do local School Science and Natural History workshops for their peers and to provide accessible support to teachers undertaking new approaches to science teaching, in K-8 classes; presentation includes AV and hands-on participation.

INTRODUCTION TO THE MARINE ENVIRONMENT
AN INTEGRATION STRATEGY

Alida Ortiz
Edgardo Ortiz
Luis Jiménez
University of Puerto Rico
Puerto Rico

Abstract

The marine oriented content and activities in the Syllabus designed by UPR Marine Education Center is an appropriate pedagogical strategy for curricular integration, development of thinking skills and establishment of learning connections between teachers, students and parents. Interaction between biological, social and cultural issues related to the sea are emphasized.

Introduction

After extensive evaluation of the educational process in Puerto Rico conducted by teachers, administrators and students, they concluded that the educational process developed by the school system is fragmented, without common objectives among disciplines. Teachers dedicated all their efforts to the particular skills and content of their discipline and thus neglected the most important aspects of education: developing an educated and socially responsible person.

The precarious situation of science education in Puerto Rico (National Academy of Science, 1967; Puerto Rico and the Sea, 1974) and the United States (National Science Board, 1983; Knapp, et. al. 1987; AAAS, 1989; Time 1990) has been brought to public attention in various reports. Science teachers are challenged with making science concepts more attractive and relevant to the student (Time, 1990). Universities and industries are requested to establish "alliances" with schools to help use of personnel, faculty and facilities to improve science education (Atkin, 1990).

Invariably, these reports despite of the education level emphasize the need for integration and relevance. This has been known under different names: curricular integration, interdisciplinary, holistic approach, even feminine perspective.

We propose that the study of the marine environment in it's geological, physical, chemical, biological, social and economic context, constitutes an extraordinary tool for the integration of the natural sciences, social sciences and the humanities.

Integration Strategies

The study of the marine environment is intrinsically interdisciplinary. It requires from the student comprehension of a body of knowledge from the natural sciences. It also demands integration of these ideas with those of the social sciences and the humanities to fully understand the social, economic, cultural, moral and ethical implications of the human relationships with the environment.

Marine education from this new philosophical point of view has hardly been used as an integration strategy in education. Fortner and Mayer (1989) traced efforts of marine education in the United States to the last 15 years. In Puerto Rico, recognizable efforts in marine education through the school system, date back to nearly five years. In some countries in Latin America and Europe their time is yet to come. Knowledge about that part of our planet which comprises almost three-fourths of its surface, has been restricted to the natural sciences and even there, to the graduate programs in very few selected schools. Very little has been done to integrate the valuable, rich experience and literature of navigators and explorers all over the world, or the sensitive poetry inspired by the sea, to the study and understanding of the marine environment.

In 1985, the Marine Education Center, sponsored by the University of Puerto Rico Sea Grant College Program, initiated a series of in-service teachers workshops to provide a first contact of teachers with the marine environment. Following the tradition at that moment, these were secondary school science teachers, specifically biology teachers who could use examples from the marine environment to present concepts in ecology, biodiversity, evolution and many others with the objective of enrich their courses. However, in presenting aspects of the marine environment such as origin and nature of beaches, it was necessary to integrate geological principles to explain the relationship between sand grain size, shape, and chemistry with inland rocks. Furthermore the study of beaches demand critical evaluation of policy decision, social and economic effects of beach use in Puerto Rico. These workshop experience also confronted teachers with moral and ethical decisions on environmental issues. Also the necessity to reevaluate the educational system and its pedagogical practices. Another outcome of these initial workshops was the need of teachers integration.

After several of these workshops with teachers from different geographical regions, disciplines and professional experience, a Syllabus for an educational activity called Introduction to the Marine Environment was developed.

In terms of integration strategy, the content of the Syllabus was approached with two questions in mind: what would be the minimum knowledge that an educated human being should have about the marine environment and how could this knowledge be spread across the disciplines that the student had to go through in formal school. In 1978, UNESCO produced a document to promote the introduction of marine sciences as subject matter in secondary schools. In Puerto Rico, curriculum format and content is determined by the Department of Public Instruction. This makes the introduction of new courses and even the reorganization or reformation of existing ones somewhat difficult. Therefore the UNESCO proposal could not be easily implemented through the administrative process. On the other hand the philosophical perspective of the study of the marine environment as an integration strategy was not explicit in the UNESCO Syllabus. We had to explore within the two framing questions, and the ability of the students to comprehend marine concepts, the ideal content for learning and teaching about the marine environment in a new framework.

Thus the content of our Syllabus includes physical and chemical characteristics of the marine environment from ocean floors to seawater. The biological world, and the human contact with the sea in all its aspects in a tightly interwoven relationship.

The pedagogical approach to the introduction of this content is the basis for the curriculum integration strategy that is the underlying theme of the Syllabus. For example the study of salinity of sea water will allow the student an understanding of geological processes such as erosion; chemical concepts like formation of salts and socioeconomic aspects related to salt production as industrial enterprises in the coastal zone. The potential environmental impact of this activity on the coast is also studied in the salt flats. A field trip or an audiovisual presentation in the class room will let the student see each concept discussed before. From this educational experience, which began as a dry, probably remote scientific discussion in the biology class, the student will write a composition for the language class and will be could to develop a research project on tolerance to different salinity levels of plants and animals inhabiting the salt flats.

Pedagogical activities such as the one described guide the student in the examination of the scope and complexity of environmental issues and the need to develop critical thinking and problem solving skills that will enable them to reach rational and applicable decisions.

Flexibility of the Syllabus is used as an integrative strategy allowing departure from the traditional courses in the curriculum. Some schools, have indeed, given the more formals courses, but many others have developed special enrichment activities for gifted students or with the same material, develop activities for underachievers or slow learners.

An important outcome of the implementation of the Syllabus is parent participation with their children in the study of the marine environment. Parents become students with their children and as a result the community becomes part of the learning experience. Learning about the marine environment is now a relevant activity and it is also an avenue for understanding the holistic and global nature of environmental issues.

Conclusions

The present work proposes the study of the marine environment as an effective vehicle for curricular integration from the philosophical perspective of the human as an integral part of the environment.

To this moment, five public secondary schools in Puerto Rico and nearly one thousand students have participated in educational activities from the Syllabus Introduction of the Marine Environment. It is also important to point out the teacher enhancement potential in that four of the five teachers who have implemented education activities from the Syllabus have been selected as Distinguished Science Teachers in their discipline, Presidential Awardees, and two of them won the Christian MacAuliffe Award for research.

Undoubtfully, teachers, students and parents that have the opportunity of participating in educational activities from Introduction to the Marine Environment, do develop new attitudes and concern about the marine environment and the human activities which impact its quality and integrity on a local and global scale.

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GROW LAB: STIMULATING SCIENCE INQUIRY WITH AN INDOOR GARDEN LABORATORY

Tim Parsons
National Gardening Association
Burlington, Vermont

Bring environmental education indoors with a specially designed GrowLab indoor garding program. Through this NSF-funded, hands-on program for grades K-8, teachers can start your own GrowLab program or develop/extend a year-round school partnership.

HOW TOXIC ARE YOU?

Dr. Esther Railton-Rice
California State University-Hayward
Hayward, California

Hazardous wastes affect every life form in every area of the environment. Some outstanding curriculum lessons have been developed for K-12 on the topics of household refuse; industrial waste; air, land and water quality. Conservation and consumer education will be emphasized in this presentation.

PLANNED COURSE IN ENVIRONMENTAL EDUCATION

Louis Ritrovato
Daniel Hewko
Pennsylvania Bureau of State Parks
Harrisburg, Pennsylvania

A 30-hour workshop designed to help secondary teachers develop and implement a nine-week, 30-hour secondary level environmental education course. The course model is designed to meet the Curriculum Requirements for Environmental Education in Pennsylvania. Teachers are involved and a series of classroom, field and community-based activities designed to assist the teacher implement a problem-solving course model with the student.

DISCOVERY BOXES: DEVELOPING "HANDS-ON" LEARNING MATERIALS FOR NATURE EDUCATION

Janet Roberts
Friends of Bellaire Parks Nature Discovery Center
Bellaire, Texas

Slides and representative boxes illustrate themes such as "Life in a Log", "Animals as Artisans", "Animal Teeth", "Seeds and Their Travel". Original, activity-oriented materials inspired by the Smithsonian, foster creativity and heighten awareness of nature in pre-schoolers-6th graders and encourage responsibility for the environment. Collection suitable for limited space.

ENVIRONMENTAL EDUCATION COURSE FOR TEACHERS

Elisa Mense Rodrigues
Secretaria do Meio Ambiente - SEMA
Campo Grande - MS
Brasil

Abstract

The development of a two-day environmental education course for teachers will be described. The course prepares and stimulates teachers to promote greater interest and consciousness of the importance of nature's conservation to their students.

The results of this course have been positive. The demand for the course including interest by other professionals of the field may be a consequence of the current preoccupation with the environmental cause.

CURSO DE EDUCACION AMBIENTAL PARA PROFESORES

El aumento poblacional desenfrenado en el mundo, ha llevado a la utilización cada vez más intensa de los recursos naturales. Esta utilización es necesaria para asegurar la supervivencia humana, pero, este uso debe ser hecho de manera racional, pues también tenemos que garantizar los recursos disponibles en la naturaleza para generaciones futuras.

Los compresión de la Educación Ambiental debe desafiar la irracionalidad antrópica para alcanzar a todos los públicos, promoviendo un sentido crítico y analítico, y como consecuencia lograr el entendimiento de la importancia y necesidad de la conservación del medio ambiente.

Preocupados por la sucesión de acontecimientos de depredación que vienen ocurriendo en el mundo y convencidos de que todavia tenemos tiempo para corregir actitudes, se desarrolló el curso de "Educación Ambiental" para profesores de I y II Grado de todas las áreas y niveles de educación, pues, se entiende que la Educación Ambiental es una cuestión multidisciplinaria y debe ser tratada como tal.

El curso se realiza en la Capital y en el interior del Estado; busca llegar a los profesores, ellos reflejan diariamente conocimientos, hábitos y actitudes que transmiten a sus alumnos, ademas poseen gran poder para cambiar comportamientos dentro de sus propias casas, dando continuidad en las próximas generaciones.

Las reglas de procedimiento adoptados por el equipo, para la aplicación de la Educacion Ambiental son apoyadas en el principio de que: "Se necesita conocer, para aprender a amar" y asi la metodología del curso espera perfeccionar los conocimientos diversos de estos profesores en relación a la Ecología evidenciando y explicando la importancia de los seres bióticos y abióticos de nuestro planeta y la interacción del hombre con estos, la fauna y la flora local, pusimos énfasis en los abordajes.

Simultáneamente se pone a los participantes en contacto directo con un ambiente natural, ambiente que subraya el valor incalculable de la conservación de la vida.

Trabajando al mismo tiempo, el dominio afectivo y cognitivo se espera como recompensa, un sentimiento de amor al medio ambiente.

Para atender mejor la carencia de materiales educativos que se usan en el aula, y la necesidad constante de perfeccionamiento, desarrollamos un Manual de Educación Ambiental que contiene textos y esclarecimientos sobre Ecología, como tambien sugerencias de actividades multidisciplinarias que los profesores fácilmente pueden aplicar.

Acompañando el manual adjuntamos un juego de carteles (cuatro) que tienen como tema: "Ambiente Rural, Conservado y Degradado" y "Ambiente Urbano, Bien Planeado y Mal Planeado."

El curso esta programado para desarrollarse en dos días (y este se adecúa a cada grupo de profesores al que se dirige, pues entendemos que estas variables deben ser consideradas). Sirve como ejemplo: un grupo de profesores y otro de alumnos del magisterio--tenemos un programa que facilita la comprensión de estos y la aplicación por los mismos de los conocimientos adquiridos.

La "pesquisa" nos ha permitido conocer la aceptación de los materiales didácticos repasados y del contenido del curso, esto nos permite evaluar y corregir posibles fallas que nos alejen de los objetivos.

Son abordados temas variados como:

- Definiciones y objetivos de la Educacion Ambiental - se explica que para trabajar en Educacion Ambiental no existen fórmulas y sí un proceso gradual de respeto por lo que nos rodea.

- Nociones de Ecología - donde los profesores aprenden o aclaran dudas respecto a varios conceptos.

- Conservacionismo y Unidades de Conservación - se hace una exposición de la importancia de las áreas silvestres y de los diferentes manejos a que estan sujetas.

- Filmes y entrevistas que se refieren a temas ambientales.

- Discusión del papel de los medios de comunicación en la Educación Ambiental, los profesores analizan lo relacionado a este asunto.

- Presentación y distribución del Manual de Educación Ambiental y del juego de carteles.

Al inicio y al término del curso aplicamos cuestionarios con preguntas referentes al asunto, para después de un analisis perfeccionar nuestro trabajo.

El curso, cuando se desarrolla en la capital del Estado, cuenta con un medio natural disponible, una Reserva Ecológica que queda a 10 Km del centro de la ciudad. Cuando se desarrolla en el interior del Estado se utiliza cualquier área natural, simulando y ejemplificando situaciones.

Desde el inicio de la ejecución del proyecto (II semestre/89), se han realizado mas de diez cursos que han llegado aproximadamente a 250 profesores, dirigidos por un equipo de profesionales técnicos en Educación Ambiental y con formación en diferentes áreas, como: biólogos, médicos veterinarios y comunicadores sociales.

A traves de la aplicación de los cuestionarios en el inicio y término del curso, se observó que una gran mayoría de asistentes al mismo se muestran satisfechos y con excelente aprovechamiento.

Acompañamos a algunos profesores quienes participaron en el curso a trabajar en sus escuelas, y observamos en los alumnos el efecto positivo que demuestran; tambien tuvimos la oportunidad de acompañarlos cuando llevaron a sus grupos de alumnos a visitar la Reserva Ecológica, allí realizamos trabajos interpretativos en trillas.

El interés por participar en el curso sigue aumentado, incluso por otros profesionales interesados y preocupados con la causa ambiental. Estamos atendiendo a todos, y cada vez que realizamos el curso, sentimos y comprobamos que estamos llegando muy cerca de los objetivos que nos propusimos.

COMPUTER-AIDED ENVIRONMENTAL EDUCATION

W.J. "Rocky" Rohwedder
Sonoma State University
Rohnert Park, California

Based on the results of the new NAAEE Monograph, this session will 1) outline the current problems and promises of computer-aided environmental education 2) highlight many "state-of-the-art" applications 3) present a perspective on the future of this field and 4) demonstrate some of the most innovative examples of environmental education "Hypermedia".

TALLER DE PERCEPCION AMBIENTAL PARA DOCENTES Y GUIAS DE TURISMO

Guardaparque Carlos E. Romero
Guardaparque Daniel O. Alcalde
Río Negro-Argentina

Abstract

This program was developed for the Tourist Guides courses of Patagonia and for use with primary school teachers of San Carlos de Bariloche in the Nahuel Huapi National Park. "Sensitization" of participants works through games and first hand experiences. Participants perform all the practical and theoretical activities that they will use with students and tourists. The workshop's conclusion consists of the creation of techniques and educational activities.

Estos talleres han sido desarrollados en el Parque Nacional NAHUEL HUAPI con tres días de duración cada uno y tienen por objetivo que los participantes se vinculen con el ambiente natural.

En todo taller es importante asegurar un buen comienzo con presentaciones informales de los participantes. Un buen contacto inicial ayuda a romper el hielo y favorece la comunicación grupal.

Existen varios juegos para comunicar al grupo; entre ellos resultan muy eficaces:

DESCUBRA SU PERSONAJE: Este juego consiste en colocar a cada participante una tarjeta en la espalda con el nombre de un personaje real o ficticio conocido como, por ejemplo, Superman, Reagan, Batman, Einstein, etc.. Cada participante podrá hacerle solamente una pregunta a cada uno de los integrantes del grupo. A la pregunta sólo se podrá contestar si o no. El juego continúa hasta que la mayoría de los jugadores hayan descubierto su personaje. Cuando esto haya ocurrido TODOS habrán cambiado palabras entre sí; y todo el grupo se habrá divertido y roto el hielo inicial.

JUGANDO VOLEY: Consiste en dividir el grupo (no mas de 10 personas por equipo) en dos equipos. Cada participante dice su nombre una sola vez, en voz alta para que todos lo escuchen, luego el coordinador trae la pelota imaginaria, verifica la correcta tensión de la red (también imaginaria) y comienza el juego. El jugador que hace el "saque", es decir, el que comienza el juego, mira a los ojos de un jugador contrario y mientras hace el movimiento de enviar la pelota, sin dejar de mirarlo a los ojos, pronuncia el nombre de este; quien al recibir la pelota imaginaria debe devolverla inmediatamente como en un autèntico juego de voley, mirando a los ojos de otro jugador y pronunciando a su vez, su nombre. Si no es el correcto es un punto para el equipo contrario; y continúa el juego hasta que el coordinador entienda que ha sido suficiente y todos los nombres hayan sido pronunciados por los participantes.

Es muy frecuente que algunos docentes y guias de turismo utilicen la información lineal como única alternativa de comunicación, obviando que a través de la interpretación tienen mayores posibilidades de vincular a sus interlocutores con el medio ambiente.

Es preciso "romper las estructuras tradicionales" de los participantes, posibilitando un contacto con su entorno ambiental que resulte a su vez, además de novedoso, atractivo. Para ello es muy eficaz posibilitar el auto-descubrimiento de sus propios sentidos, y a través de ellos sentirse mas integrados a su entorno ambiental.

En las localidades próximas al Parque Nacional resulta aún hoy frecuente que los maestros enseñen, por ejemplo, reproducción vegetal, botánica y zoologia dibujando las plantas y los animales en el pizarrón, y por lo general, con láminas que ilustran flora y fauna ajena a la región, sin considerar la posibilidad de utilizar como herramienta de enseñanza el medio silvestre que tienen alrededor.

Por esto, es nuestra intención que a través de la Educación Ambiental los maestros de las escuelas comprendan la conveniencia de trabajar CON y EN la Naturaleza. Esto con seguridad brindará una enseñanza mas real y comprometida. Como dijo San Eduardo: "Hay más sabiduría en los bosques, que en todos los libros".

Es importante que los participantes conozcan y comprendan las posibilidades que ofrecen las técnicas interpretativas de comunicación, para ello nada mejor que la experiencia.

Divididos en pequeños grupos, ellos deben elaborar sus propias definiciones de Interpretación, indicando también para qué suponen que sirve y cuáles son sus ventajas. Luego se cotejan todas las definiciones surgidas hasta lograr una acabada y ajustada a la real. Luego como complemento se realizan juegos vinculados al tema, como, por ejemplo:

DESARROLLO DE LOS SENTIDOS: Se forma un círculo con los participantes sentados en el suelo, con sus ojos tapados con un pañuelo. El coordinador le entrega un objeto a cada participante, estos lo reciben y, a través de los sentidos, del olfato, gusto, oido y tacto deben familiarizarse con él. Luego de unos minutos deben pasar su objeto al vecino y repetir la experiencia; así sucesivamente hasta que todos reciben nuevamente el objeto que tuvieron al comienzo. Luego el coordinador retira todos los objetos y los coloca en el centro de círculo y pide a los participantes que se saquen los pañuelos de los ojos y que cada uno tome cualquier objeto. Es frecuente, que la mayoría tome como propio el objeto inicial de cada uno. Luego se dialoga sobre el sentimiento de pertenencia que todos los participantes tuvieron con el objeto inicial o algún otro, encontrando su correlato con el sentimiento que se puede despertar en las personas hacia la naturaleza.

PASEO A CIEGAS: Se forman parejas, uno de los dos integrantes se cubre los ojos con un pañuelo mientras el otro le sirve de guía, conduciéndolo por un sendero natural que tenga variaciones, por ejemplo: suelo liso, disparejo; sectores de sol y sombra, con ramas; orillas de ríos o arroyos, etc. Luego se retorna al punto de partida y, con los ojos descubiertos, deberá recorrer nuevamente el mismo sendero. Luego se invierten los roles para que todos tengan la experiencia completa.

La forma de conducción de los guías hacia los turistas y de los maestros hacia sus alumnos debe tener fundamentalmente un lenguaje simple y claro. La comunicación gestual, generalmente, dice mas cosas que la expresión oral. Por esta razón es imprescindible que en estos talleres se desarrollen actividades que introduzcan en el conocimiento de las técnicas psicológicas, en lo que respecta a las diferencias entre infancia, adolescencia y adultez; sus posibilidades y dificultades en la comunicación y en lo atinente a los tiempos individuales y grupales; el temor a lo nuevo y la resistencia al cambio, conocerlo para encontrar alternativas de solución, la importancia de la actividad lúdica en el aprendizaje. Esto último es algo que no se puede deshechar: "No hay nada mas serio que el juego de los niños".

En síntesis, con estas técnicas se busca darle un lugar preferencial a la sensibilización y experiencia por sobre el conocimiento y su expresión estereotipada.

Todos sabemos que los árboles están vivos, pero sólo tenemos una cabal comprensión de lo que ello significa cuando sentimos su latir.

Es conveniente asegurar una red de comunicación entre los participantes de manera que los resultados obtenidos por cada uno de ellos pueda ser compartido por todos los demás.

Para finalizar un taller debe existir un método evaluativo que sirva tanto a los participantes como a los coordinadores. De esta manera los primeros podrán saber en que cambió su percepción tras haber realizado la labor. Por su parte los coordinadores podrán determinar si han sido satisfechos sus objetivos.

Como métodos evaluativos prácticos utilizamos lo que se da en llamar "Síntesis Expresiva". Esto consiste en comentar o en hacer público las experiencias y percepciones obtenidas a través de técnicas o mecanismos no convencionales, como, por ejemplo:

- Collage
- Mímica
- Teatralización
- Marionetas
- Guitarreada
- Plástica: Dibujo
  Maqueta
- Poemas
- Canciones
- Otros

MANUAL DE EDUCACION AMBIENTAL PARA ESCUELA PRIMARIA

Sus Técnicas

Guardaparque Carlos E. Romero
Parques Nacionales
Argentina

Abstract

This handbook consists of twelve interrelated topic units focusing on the main environmental issues present in the Andean-Patagonian area. Each unit uses the "Scientific Method" and allows the learner to investigate a problematic situation, to propose a hypothesis, to infer, to predict, to theorize and to search for alternative solutions.

La Educación Ambiental, como todo proceso que tiene relación con lo natural, ha experimentado con el tiempo, una serie de cambios que posibilitan su mejor adaptación al medio en el cual es aplicada; obteniendo cada vez mayor eficacia en el logro de sus objetivos mediante una práctica mas eficiente.

Cuando hablamos de medio ambiente, en la educación ambiental, debemos considerar dos conjuntos básicos permanentemente interrelacionados:

EL MEDIO NATURAL: Integrado por componentes bióticos y abióticos en constante interacción: agua, suelo, atmósfera, flora, fauna, etc.

EL MEDIO SOCIO-CULTURAL: El hábitat del hombre moderno, constituido por obras de todo tipo y desarrollado a partir de sus conocimientos y creencias y para su subsistencia y bienestar.

Estos dos ámbitos están estrechamente vinculados y de su relación armoniosa o conflictiva depende la mejor o peor "Calidad de Vida".

La educación ambiental es considerada hoy como un proceso a través del cual se busca lograr un cambio de actitud en el Ser Humano en su relación con el medio ambiente y con el propósito de lograr una mejor manera de vivir.

El problema ambiental actual deviene de la intensidad y modalidad con que el hombre encara esas relaciones recíprocas de su medio natural y social. Hoy sabemos que algunas acciones producidas en medios urbanos generan presiones nunca vistas en sistemas naturales y con resultados que por lo general escapan a los cálculos de previsión del hombre, produciendo cambios ambientales que, por inesperados dejan al hombre sin capacidad de respuesta inmediata y que lo obligan a destinar importantísimas sumas de dinero y decisiones políticas para corregirlas; lo cual además, no siempre se logra.

Habiendo olvidado que la naturaleza es fuente de vida y que de ella dependemos, se experimentan hoy los efectos de ciertas alteraciones físicas, químicas, psicológicas y espirituales, que son el resultado no deseado ni previsto de una inadecuada relación con el medio ambiente.

Sin embargo, es cierto que ya se experimenta una necesidad de revertir este proceso de auto-deterioro protegiendo y mejorando la riqueza de la tierra y sus recursos, y los bienes creados por el hombre.

Para lograrlo es preciso desestructurar al hombre de la escala de valores sustentada en la creencia de la inagotabilidad de los recursos y en su omnipotencia para decidir sobre su calidad de vida divorciado e ignorando su estrecha vinculación y dependencia del medio natural.

La modificación de este particular modo de ver las cosas: el hombre como omnipotente dominador y dueño único de todo lo creado, supone un fuerte cambio de actitud que se intenta lograr a través de la educación.

En esta perspectiva, el sistema educativo se proyecta como uno de los más ricos instrumentos para que individuos y grupos sociales, incorporen conocimientos, experiencias y vivencias que faciliten y posibiliten el cambio de actitud deseado. La educación ambiental, en el sistema educativo permitirá al hombre reencontrarse con su origen y reconocer su pertenencia biológica y aceptar el orden natural y sus leyes, las que deben ser respetadas para lograr su propia supervivencia.

Bajo este contexto fue elaborado el "Manual de Educación Ambiental para Escuela Primaria (Ciclo Superior)". En él se han incluido 11 unidades temáticas fundamentales y otras actividades complementarias. Estas Unidades son:

1. "El Origen de la Vida"
2. "El Agua, su importancia para los seres vivos"
3. "El Suelo"
4. "El Aire y los seres vivos"
5. "Nociones de fragilidad y contaminación Ambiental"
6. "Usemos los Sentidos"
7. "El Observador Meteorológico"
8. "Nociones de Evolución y Adaptación al medio"
9. "Flora y Fauna Regional"
10. "Los Parques Nacionales"
11. "El Uso de la Energía"
12. Actividades Complementarias: - Jornada de Integración
    - Juego de Simulación de Roles.

Cada uno de estos tópicos han sido incluidos tras un análisis de los principales problemas ambientales que sufre la región andino-patagónica. La determinación de ellos como temas a trabajar en el manual respondió a dos factores fundamentales:

a) Deterioro del ambiente o del recurso. (Por ejemplo: agua, suelo, flora, fauna, etc.)

b) Desconocimiento y/o desinterés de estos problemas en las poblaciones vecinas a los Parques Nacionales y demás áreas silvestres.

El desarrollo de clases sobre medio ambiente debe ser un objetivo común a todas las disciplinas educativas. Se cometería un error si se las intentara circunscribir a las ciencias biológicas exclusivamente.

La biología y la geografía pueden ser considerados "ejes" de un sistema interdisciplinario que incluya lo ambiental en las actividades de plástica, lengua y expresión, historia regional, formación cívica, matemáticas, entre otras.

Para una buena formación integral del individuo deben incluirse conceptos de educación ambiental desde la infancia. Pero esto no sólo responde a los lineamientos de la política educativa local sino que, fundamentalmente, queda librado a la labor entusiasta y comprometida de los docentes.

En este manual sólo se encontrarán pautas para la acción. Aquí no está "El Saber", este se encuentra sólo en las personas; y la educación ambiental a través del uso de la Interpretación como técnica fundamental posibilita su descubrimiento.

La estrategia diseñada para el armado de este manual estuvo dirigida a que el alumno enfrente, analice y resuelva respectivamente:

a) Su realidad ambiental
b) El estado óptimo e ideal del medio ambiente
c) La necesidad de tomar medidas para encontrar un equilibrio posible entre las dos primeras.

Para llevar a la práctica el desarrollo de este manual no es requisito indispensable que el docente sea un conocedor de ecología. Cualquier maestro especializado en distintas temáticas educativas podrá realizar las actividades en el incluidas. La técnica dominante en este manual es la denominada "Estrategia del Preguntar", a través de la cual el participante se sumerge progresivamente y sin notarlo en niveles cada vez mas profundos de reflexión y compromiso con la tarea encarada. El Trabajo lo realiza el alumno, el maestro sólo debe acompañar en la búsqueda de los interrogantes que surjan. El rol protagónico debe ser transferido del maestro al alumno, para posibilitar su crecimiento y su descubrimiento sin estereotipos de ninguna naturaleza.

Los alumnos estarán aplicando permanentemente el "Método Científico", mecanismo por el cual el individuo aprende a observar, clasificar, analizar fenómenos, predecir, formular hipótesis, experimentar y elaborar conclusiones.

Esto determina que cada estudiante sea el artífice, el responsable primario de su propio aprendizaje. Las experiencias de "Primera Mano" que tendrán los estudiantes en los trabajos de investigación y en los juegos interpretativos servirán como móviles para que aflore la sensibilidad de cada persona. Estas actividades están reforzadas por acciones y juegos extraídos de técnicas de psicología gestáltica, lo cual potencia el grado de sensibilidad y entrega de los participantes. Las conclusiones a las que arriben serán propias de cada uno. Nadie les dirá "cómo hacer las cosas", esto será obra de su exclusiva responsabilidad.

Se ha pretendido que los que practiquen este manual adquieran una actitud positiva con respecto al medio ambiente, que se sientan movilizados y capacitados para en

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el futuro, participar en las acciones que se proyecten y realicen en su medio ambiente, en la ciudad y en las Areas Protegidas con una auténtica conciencia ambiental.

Quien haya adquirido una genuina conciencia ambiental sabrá que de nada sirve mirar y criticar; que es necesario pensar y actuar. Que es imprescindible participar y que los cambios sólo se logran mediante la acción.

Para dejar de preocuparnos es necesario ocuparnos.

NEGOTIATING THE ENVIRONMENTAL EDUCATION SYLLABUS

Paul McD. Rowland
Center for Excellence in Education at NAU
Flagstaff, Arizona

Abstract

A graduate level course for teachers entitled Environmental Education was taught using a syllabus that combined the traditional teacher-developed syllabus and the negotiated syllabus. The negotiated portion of the syllabus allowed the course to specifically address student needs while the teacher-developed syllabus provided a common framework for analysis.

Introduction

In traditional university instruction, the method and content of a course are determined by the professor and laid out to the students in a course syllabus. Recently, many universities have required faculty to give students rather specific syllabi at the beginning of the course. Although this approach lets students know what to expect of the course, it makes it difficult to adjust a course to the diverse needs of the different populations of students that enroll in the course. That is, the assumption of a specific syllabus is that a course can be designed for a generic set of students and that course can then be offered to any population that happens to enroll for the course.

The alternative of having a course evolve from the needs and desires of the students has been described as a negotiated curriculum (Millar, 1989). Millar's use of curriculum negotiation has been limited to education courses that emphasized the development of curriculum. He has indicated that up to one third of the course may be spent in the negotiation process. Although that may be a useful way to spend time in an adult education curriculum course, in a course in a different content area, such as environmental education, such use of time would frustrate students and be considered irresponsible by some.

What has evolved for me as a powerful compromise between these extremes is a semi-negotiated syllabus. When the course begins only part (usually half) of the course has been determined by the instructor. The purpose of that portion of the course is to provide a framework or frameworks for examining the subject matter of the course. The remainder of the course is determined by the students in negotiation with the instructor, thus the syllabus evolves during the course to meet the expressed needs of students. When the needs of students vary considerably and no consensus emerges, there is a need to develop multiple options for students. What follows is a description of an environmental education course based on these principles.

The Context

The course, Environmental Education, was a graduate level course for teachers in Science Education at East Carolina University. The course was originally designed to present scientific information about environmental issues and EE teaching methodologies. The twenty students in the course were nearly all teachers with one to twenty years of experience. Most were working on master's degrees in science education and nearly all were teaching science at the secondary level.

Part I: Building the Framework

The purpose of the first part of the course (the teacher directed portion) was to provide students with a framework for organizing information about environmental issues and techniques for presenting them. Typically, theoretical frameworks were presented and then followed with an activity that showed how the theoretical framework operationalized in the classroom.

The initial class dealt with defining the domain of environmental education and an overview of the history, philosophy, and goals of environmental education. The following classes addressed the variety of ways to look at environmental issues including: a critical literacy (Shor & Freire, 1987) approach to reading about environmental issues; a scientific components/compartments analysis; the development of environmental attitudes (viewed through both David Gray's Psychometric model and Ajzen and Fishbein's Theory of Reasoned Action); economic analysis of environmental issues (the role of externalities); and aesthetic and ethical views of environmental issues. In addition, one class, based on the NAAEE publication:

Trends and Issues in Environmental Education (Disinger, 1987), dealt directly with the issue of fitting environmental education into the curriculum while another class dealt with the variety of teaching methodologies appropriate for meeting the various goals in environmental education.

Part II: Meeting the Needs of Students

At the end of the first part of the course students were asked to respond to: What I'd like to learn in this class for the rest of the semester. The responses were diverse and an analysis revealed that most fell into two expected clusters of "information about environmental issues" and "strategies/methods for teaching EE." However, an examination of the clusters revealed diversity in what students wanted. For example, the strategies requested included: games, lab activities, case studies, community investigations, field trips, etc. The topics students wanted information about included: acid rain, recycling/solid waste, water pollution, toxins, oil spills. In addition, some students wanted the classtime spent developing an EE curriculum while others wanted to do an activist project (campus recycling). Indeed, some students indicated that their request was to be exclusive of other requests (Less method more information). It became clear that it would be difficult to meet the needs of this population of students unless some individualization was employed.

Two techniques were proposed by the instructor to address the diverse needs expressed in writing by the students. The first technique was to create as many options as possible for students by establishing learning stations and having students spend the in-class time working at those stations. The stations included: examining information about EE in local parks, playing EE board games; doing acid rain lab activities; evaluating EE audio-visual materials; working through case studies; attending an environmental public hearing; running EE computer simulations; playing a population simulation game; and doing Project Wild activities. All students completed at least four different stations.

The second technique was to restrict homework to a single project for each student. The suggestions for projects ranged from: a term paper on a topic of interest to developing curriculum to collecting instructional materials to documenting activist participation in an environmental problem. The choice and results of the projects reinforced the appropriateness of this component in meeting individual needs. A chemistry teacher investigated using microscaling to reduce production of toxic wastes in her classroom. A biology teacher who started with a term paper on tropical deforestation ended up with a term paper and a packet of student activities. A middle-grades teacher who developed a learning cycle for exploring environmental concerns in her county stated that she now had " a framework . . . to teach the importance of protecting the environment . . . " Another middle grades science teacher became actively involved in solving the solid waste problem and after organizing a can recycling drive in her school and making visits to the landfill and local officials stated, "I now have recycling on my brain." She then wrote, "I realized that my project was not something that I just did for a grade to forget at a later date. I feel that I have adopted the problem as my own." Another teacher who collected EE materials to be infused into her middle grades social studies unit on North Carolina geography wrote, " My students are enjoying this unit and becoming young environmentalists. I would like to extend this project further next year by starting an Environmental Awareness Club after school." Other projects with similar testimonials included: developing a nature trail at the school with activities for teachers to use on the trail; developing a unit on groundwater hydrology, pollution, and remediation; developing a laboratory unit on acid rain; creating a computer simulation on detecting groundwater contamination sources; joining a committee to investigate and plan for solid waste disposal; developing an interactive laser disc program on tropical deforestation. Finally, one teacher's project deserves mention. This middle-grades science teacher worked with the students in his classes, the student council and school administrators to establish a school-wide paper recycling project; establishing teams to conduct the various jobs from setting up drop off points for paper to storage to arranging for delivery. In the course of four weeks, more than a ton of paper of paper had been collected. He wrote about the significance of the project by describing an event that occurred while his students were on a field trip. After eating lunch, the students collected papers to recycle. When questioned as to why they were doing this by a teacher from a different school a student replied, " Do you like to breathe?" and then proceeded to educate the teacher about the interrelationships among paper, trees, photosynthesis, and oxygen. He summarized the project as follows: " It has given my students an outlet as to what they personally and collectively can do to change what they don't like."

The combination of both in and out of class choices were highly motivating for the students. The course met their needs and appears to have made a difference.

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Millar, C. (1989). Educating the educators of adults: two cheers for curriculum negotiation. J. Curriculum Studies 21(2), 161-168.

Shor, I & Freire, P. (1987). A Pedagogy for Liberation. Bergin and Garvey: Boston.

INITIATIVES: CREATIVE PROBLEM SOLVING

Carole Rylander
Hunt, Texas

After students become aware of environmental issues, do they have the skills to take charge, cooperate, and make changes? A series of group building activities called initiatives is presented. Students must learn to work together utilizing everyone's strengths and responsibilities. The initiatives are fanciful problems using environmental issues.

TEACHING ENVIRONMENTAL STUDIES AS A NON-SPECTATOR EXPERIENCE

Floyd Sandford
Coe College
Cedar Rapids, Iowa

Abstract

This is an opportunity to share with other environmental educators some activities (personal journal, letters, and others) used in a college Introduction to Environmental Studies course that are designed to promote greater awareness of environmental problems in a way that encourages active interest and involvement with the issues.

Over 50% of the students taking the Introduction to Environmental Studies course at Coe are there to fulfill a college graduation or distribution requirement. The course qualifies as (i) a writing emphasis course, (ii) a non-lab science course and (iii) one of several courses in the "modern world" western culture cluster [all students must take courses in both foreign culture and western culture, of which there are several "clusters" from which to choose]. By taking the environmental studies course, a clever student can "kill" three requirements with one stone.

Although some students take the course because of a genuine interest in environmental issues, the challenge is to stimulate the majority, to encourage them to see the relevancy of the subject matter to their lives and quality of life, to their future well being, perhaps their survival.

Although students are expected to develop knowledge and competency of major ecological facts and concepts and an understanding of major environmental issues, the general approach is to de-emphasize formal testing and promote an experiential and involvement tact. The strategy for accomplishing this aim is as follows:

1. Firstly, each student keeps an environmental journal. Each journal entry is to be dated, and should reflect the students personal thoughts regarding environmental issues--reactions to text reading assignments, in-class discussions, films seen in class or assigned for outside viewing, newspaper articles, etc. The students are shown sample pages from the journals of previous class members, but are to produce a journal that is a reflection of their own personal concerns, ideas, or point-of-view. There are

no restrictions as to what can be in the journal, as long as the journal indicates a **thoughtful** and **personal** consideration of environmental issues. There are definite costs and benefits associated with requiring a journal, not the least of which is the time commitment involved in reading and evaluating the journals students produce, many of which are thick and represent an impressive commitment of time on their part.

Students are encouraged to use recycled paper, both sides of virgin paper, or the reverse side of previously used paper. With the exception of 4 assigned journal entries the students may make journal entries of any type or kind, including poetry and art, as frequently as they want. Many elect to follow environmental articles in the local newspaper during the semester. Because the journal is not a scrapbook they are told that any newspaper or magazine articles must be accompanied by their own personal thoughts or views regarding the subject matter discussed. They may note any journal entries of which they are especially proud or any which they consider too personal to be read. The journal is worth 25% of the course grade. It is not evaluated according to its weight, but according to how much evidence a student gives of significant, genuine and thoughtful consideration of the issues. Particular emphasis is given to the four required journal entries which are as follows:

#1 Environmental credo--after the first week of class each student records how they perceive the earth and their relationships to it.

#2 Each student writes a short paragraph describing one possible change in their personal life style that would let them "walk more softly on the earth" and help move the planet in the direction of sustainable earth societies.

#3 Each student writes several paragraphs on the topic "Why should I care about trees?". They are asked to research and (i) to list as many possible goods and services provided by trees, (ii) to explain the English proverb "those who plant trees love others than themselves", and (iii) to conjecture how the destruction of tropical rain forests might directly or indirectly impact on their lives, and what they might individually do to help halt the destruction.

#4 Each student conducts a one week personal energy/resource survey towards the latter part of the course, recording at least 10 instances of energy or resource overuse or misuse, and what they might do to change.

In addition to the journal, other activities are used to increase students personal involvement with the issues.

2. The Midterm exam has a takehome component. Students have a week to write a 5-minute persuasive and factually-based testimony for a theoretical public hearing pertaining to the impending destruction of a threatened Iowa wetland. Pertinent information on Iowa wetlands is placed on library reserve for student use, and several of the students eventually present their testimony in class.

3. Several in-class debates or mock legislative hearings are held. Topics are chosen on the basis of class interest and usually include the issues of population/hunger ("Is the essence of the problem one of too many people or too little food?") or of endangered species ("Up to what point is an endangered species worth the effort of saving?").

Environmental studies students should not only be aware, appreciative, and concerned about environmental issues and competent in understanding the facts and relationships involved, but should be able to communicate this information to others, as effectively as possible. Only a handful of students have in 15 years voiced intense fears about having to express themselves in front of a group, and for such students a different assignmemt is devised.

4. Lastly, each student writes a persuasive and factually-based letter on an environmental issue of personal concern to an individual, corporation head, politician, etc. The students are asked to submit rough drafts which are evaluated and returned with suggestions for improvement. A polished, readable, and compelling letter is submitted with a properly addressed stamped envelope and a copy of the letter. If and when responses are received they are shared with other class members. Many students become very excited when their letters are answered, and oftentimes positive change results, for which the students feel especially good.

Letters sent to college personnel have resulted in energy and resource conserving changes on campus such as a lighting-reduction program, installation of new windows in dormitories, and a phase out of all stryrofoam products by the college food service. In the Fall of 1989 ten of the 66 students in the class wrote to their state senator or representative and/or to Iowa Governor, Terry Branstad, regarding pending state environmental legislation. Up until May 8, 1990 Iowa was poised to become the first state to devote all state lottery profits--$40 million a year for the next ten years--to environmental incentives, including resource enhancement and protection, recycling, waste volume reduction, energy efficiency, soil conservation, acquisition and protection of natural areas, and environmental education programs. But on May 8 Governor Branstad, citing the need "to protect fiscal integrity", vetoed $12.6 million from the lottery-funded environmental package--monies to fund waste volume reduction and energy efficiency programs, among others. A beginning, albeit a discouraging one. Future letters may help.

LEARNING BY DESIGN

Alan Sandler
American Institute of Architects
Washington, DC

A hands-on exploration of how we learn, perceive, and make decisions about the built environment. The session participants will discover their teaching/learning styles, explore the design process as a decision-making tool, and experience the process of locating local resources for classroom use. The presentation includes group discussions, video and slide presentations, hands-on experiences, and options for self-discovery and personal use of materials.

A DESCRIPTION OF A MULTIFACETED ENVIRONMENTAL EDUCATION PROGRAM IN A SUBURBAN HIGH SCHOOL

Gerry Saunders
Tim Golden
University of Nebraska
Lincoln, Nebraska

This presentation will describe a broadbased environmental education program developed at a midwest high school. The program incorporates modified curriculum in traditional classes, action research, and extensive outdoor experiential activities. Field program sites range from the local to international. The program emphasizes personal growth, problem-solving and knowledge of ecological principles.

USING AD HOC FACULTY TO DEVELOP AND TEACH UNIVERSITY ENVIRONMENTAL EDUCATION COURSES TO INSERVICE TEACHERS

Dr. Daniel Sivek
Ms. Nancy Cripe
University of Wisconsin
Stevens Point, Wiscosin

Describes four environmental education courses for inservice teachers being developed in cooperation with and taught by ad hoc instructors. Results of instructor evaluation of the development stragegies and of student evaluation of the courses will be shared.

ENVIRONMENTAL EDUCATION IN QUERETARO

Ing. Alejandro Spriu
Queretaro, Mexico

Queretaro has had a great development regarding environmental education activities and environmental regulations during the last few years.

ENVIRONMENTAL EDUCATION ACTIVITIES FOR THE PRESCHOOL CHILD

Vicki D. Stayton
Western Kentucky University
Bowling Green, Kentucky

Research suggests that young children learn best when they are actively involved with materials and their environment. Environmental education activities provide a vehicle by which preschoolers can learn using all of their senses in a highly motivating environment. This presentation will actively involve participants in activities appropriate for children ages 3-5. Activity descriptions will be provided.

POPULATION EDUCATION: HANDS-ON, FOR EARTH'S SAKE

Darleen K. Stoner
California State University-San Bernardino
San Bernardino, California

An introduction to simulations, games and other hands-on activities to teach young people about human population growth and its environmental impacts. These classroom-tested strategies are fun, effective ways of helping students understand important issues and learn how everyone can contribute to a sustainable environmental balance. Free materials!

STRATAGEM

Pamela Schwartzberg
Ontario Ministry of Energy
Toronto, Ontario, Canada

Abstract

Stratagem is a sophisticated simulation game using a game board and a computer. The game provides a clear basis for understanding the facts about energy and the environment and their interdependencies and interrelationships. The presentation will explain the game; it's role in the secondary school curriculum; distribution and in-servicing mechanisms; and feedback from educators.

If you had a chance to run the affairs of any nation in the world today, what would you wish to achieve? Energy security? Stability? Prosperity? Food, shelter and jobs for all? An unpolluted environment? How would you go about doing it?

Many international affairs and global development experts are advocating a new goal for all nations of the world. This goal is called "sustainable development", development that is both economically and environmentally sound. They point out that fundamental principles and relationships exist between a country's population, its standard of living, energy use, economic output, international trade and environmental quality; and that these are often overlooked in real life when developing programs to enhance the productivity of a region's energy, environmental, and human resources.

History and Purpose

In 1983-84, the Division of integrated and Special Projects at the International Institute of Applied System Analysis in Vienna, Austria, was asked to find an effective way of demonstrating to Latin American aid officials the many interconnections among various development issues, and the long-term effects of different policy options on energy,, the economy, the environment and human welfare. The IIASA team of scholars and international development officials worked with Dennis L. Meadows, co-author of the book, "The Limits To Growth" and a Professor of Engineering.

Using their many years of experience in designing computer simulation models, the IIASA team created the original version of Stratagem. It took the form of a game based on the relationships among the following five components of development.

1. Population growth and the household consumption of food and material goods;
2. Energy production and efficiency;
3. Industrial production and social services;
4. Food production and environmental protection, and;
5. International trade and foreign debt.

In 1986, the game caught the attention of the education officials at the Ontario Ministry of Energy. We noted that Stratagem's pervasive energy themes and its congruency with the Ontario Curriculum guidelines. As well, the game was found to capture effectively the unique nature of energy as an interdisciplinary school subject. Stratagem provides a clear basis for understanding not only the facts about energy and a multitude of related subjects, but most importantly, the interdependencies and interrelationships. As a result, the Ministry funded the adaptation and packaging of Stratagem for use in secondary schools throughout Ontario.

What is Stratagem?

Stratagem is a sophisticated simulation game using a game board, playing pieces and a computer. Players take roles as government ministers and run the affairs of their own developing country over a fifty-year period. When the game begins, their country is at a stage of economic and social development similar to that found widely in Latin America and Asia today. The goal is to reach a high standard of living and a sustainable level of development by the end of the game.

The challenge of the game is finding a path to sustainable development. Players are given the freedom to implement a wide range of social and economic decisions, but they soon discover that if they are to be successful, their actions must reflect an awareness of the many cause-effect relationships at work in the economy. The Ministers try to assess the best course of action for their own ministries and the country as a whole. Players must also think through the ethics and the mechanics of their strategy.

The game is not won or lost in the usual sense of the word, although teams can compete with each other in providing the best standard of living for their country. Winning is more accurately measured by the success of the players at keeping their country steadily advancing on a development path of their choosing, despite the obstacles. Players will learn that there is more than one path to sustainable development. Many paths will work and many more will not. Stratagem enables players to develop programs and policies that lead either to success or to collapse.

How the Game is Played

Each player is assigned a role as minister of one of five government portfolios responsible for sustaining the growth of their country and for meeting the short-term needs of their people for food, goods and energy. Starting at a stage of development similar to that found in many Latin American and Asian countries today, the ministers work together as a cabinet making a number of decisions about where to allocate their available food, goods, and energy resources. These decisions affect the growth of their population, the extent of their food, goods, and energy production capacity; the availability of social services; the quality of the environment; the efficiency of their economy; the level of exports; and the size of their foreign debt.

There are 10 rounds or "cycles" in the game. In each cycle, the set of decisions made by the cabinet influences the development of their country over a five year period. The ministers use the game board and playing pieces to map out their decisions and at the end of each cycle of play, these decisions are fed into the computer. The computer program models the economy of a hypothetical country, and it processes the players' decisions to calculate the results. These figures become the basis for the next cycle of play.

What are the Roles?

Players are assigned specific roles as ministers in charge of one of the following five portfolios:

1. Minister of Population--responsible for population growth and standard of living.
2. Minister of Energy--responsible for energy production and efficiency.
3. Minister of Goods and Services--responsible for industrial production and social services.
4. Minister of Food and Environment--responsible for food production and environmental protection.
5. Minister of Trade and Finance--responsible for foreign trade and financial affairs.

Each team needs a minimum of five and a maximum of 10 players. Shared portfolios is recommended as it forces players to verbalize their assumptions, goals, and strategies.

Stratagem conveys many important insights, so it takes time to play. It can be played without interruption in five to six hours, including an introduction and debriefing; or it can be played in cycles during 70 minute class periods, over the course of several weeks or more.

Curriculum Placement

Stratagem has been extensively played, tested and reviewed by Ontario secondary school teachers. Most have used the game in their senior level Environmental Science and Geography classes, but some have found that even their Grade 10 students have been able to handle the complexities of the game.

As well as Environmental Science and Geography classes, other secondary level courses suggested as being relevant for Stratagem gaming sessions are World Issues, Economics, and Mathematics. Stratagem is well suited for the desicion-making component of any course.

The goals and objectives of Stratagem are also in keeping with many of the course and cognitive skill objectives prescribed by the secondary school curriculum in Ontario. Some of the may skills called on or developed by Stratagem and its accompanying activities are:

- Information Processing Skills, including analysis of complex problems, gathering information, developing goals and planning strategies, reading and research, problem-solving, designing/revision and promoting or opposing proposals.
- Group Activity Skills, including group problem-solving, persuasive argument or debating, small and large group discussions, diplomacy/fact, compromise.
- Skills in Graphing and Charting, including interpretation, decision-making and mathematics.
- Human Relations Skills, including bargaining/negotiating, helping/supporting, persuading/influencing, role-playing, self-evaluation and evaluating peers, managing resources, communicating

As a flexible classroom tool, Stratagem can be used to complement the existing curriculum in several ways:

- as an introductory, motivating and sensitizing experience to prepare students for an upcoming unit;
- as a means of presenting a major portion of the content, or;
- as a way to sum up, reinforce or extend the unit's lessons.

Distribution

The Ontario Ministry of Energy is currently distributing Stratagem through Energy Educators of Ontario, a non-profit teachers association which has a mandate to assist educators to upgrade their knowledge and skills on energy topics.

School boards have been invited to send a representative to a Train-the-trainer's workshop. The trainers then deliver in-servicing to teachers within their boards.

Plans are underway for a provincial Stratagem Competition and a national Stratagem Competition.

INFUSING ENVIRONMENTAL EDUCATION INTO THE SECONDARY CURRICULUM

Harold Thiele
Missouri Department of Conservation
Affton, Missouri

Junior and senior high school life science teachers find themselves bound to a very structured approach in covering their particular discipline as alternatives to textbook domination are rarely used. This session will address the barriers that need to be overcome in order to stimulate these teachers to use a unique set of instructional units on environmental topics for specific curricular areas as they interact with the resources of their community.

SUBLIME ENVIRONMENTAL EDUCATION

Lic. Jorge Gonzalez Torres
Mexico, D.F.
Mexico

Abstract

In this program we use sound and imagery to awaken the social consciousness in the matters of love and respect for the fundamental elements of life, "air-water-soil-sun." Through the identification of the fundamental elements of life with the essence of the human being we may encourage the practice of care and respect for minerals, vegetables and animals, as well as conservation of the environment.

The urgency of an awakening and the necessity of consciousness has turned our efforts, our desires and our hopes into a struggle to protect all living things. Yes, this has become a true struggle to protect life. This objective in Mexico City is the most important challenge.

Mexico City is in the world one of the most contaminated, overpeopled, illiterate and indebted cities. It is a city suffering air, water and soil pollution and scarcity, a city causing material damage to agriculture, monuments, rivers, lakes, jungles and forest,-costing the government billions that it does not have. With the uncontrolled growth of the population comes an uncontrolled growth in problems, just to mention a few: more cars, more factories, more noise and of course more contamination, more housing, fewer green areas, more trash, and more disease. Unemployment leads to more illegal logging, an increase in the illegal traffic of birds and plants, and the saddest is the cancer of illiteracy.

If we think of our people as Mexico's main and most important product and educate them, then Mexico will have a powerful force, and might have a chance for survival, but only if we succeed to touch their hearts and their minds. To do this we must improve the knowledge of the population and influence them through publicity and encourage the principle of cooperation but the most important is to make them understand that we are an integral part of the vast network of life, that we make up a unity, and we cannot live independently from one another. Whatever one damages, hurts or kills, have a direct effect on oneself, because we are part of that unity, because we are part of nature. We are the species responsible for saving a city, a country, and a planet. Our aim is to reach the inner self, to tell you that you are the sun, the air, the water and soil. If that is not enough reason to love and respect nature then what is?

To do this has really been a task, since we receive little or no support from the government. To the contrary, the government is sometimes an obstacle to our goals. This makes it difficult to awaken, and to make people conscious of our danger. The government does not understand that we can work together to educate our people.

So due to our personal harsh experience, our deepest purpose is to make a world wide contribution, which can and should be applied all over, and that is our "Sublime Environmental Education," the path to reach the inner self of the individual, to make them act positively by feeling themselves part of nature, motivating them to make their contribution to their habitat. Our most important objective is to "plant" in their hearts a love of life.

Our material has four thirty-second television spots, which we call "Sublime Environmental Education" because the spots contain no words, just sound, music and imagery. Our goal is to instill in the viewer to want to breathe clean air, drink clear water, touch fertile soil and see a hopeful sun.

CURRICULUM DEVELOPMENT FOR EE IN DUTCH EDUCATION

Jacques van Trommel
Netherlands

Recently the government had the National Institute for Curriculum Development (SLO) formulate attainment targets for most school subjects (primary and secondary). Environmental aspects had to be built in. The EE project group of SLO developed a core curriculum for EE, describing aims and overall content. Environmental issues will be embedded in all relevant school subjects as the next step.

"NUEVOS HORIZONTES: UNA EXPERIENCIA EDUCATIVA"

Elisa Eugenia Corrales Vargas
Maria Elena Barajas de Kossio
"Nuevos Horizontes"
México

Abstract

The purpose of this Center is to offer environmental education, focusing on the environmental behavior for the development of the child. Learning for the preservation of the environment as a daily practice, integrating parents into the education community and to obtain congruity and generalization to family environments are all stressed. In six years we have achieved the development of strategies to show the environmental impact of our behavior, integrating the content of environmental education into the rest of the knowledge areas.

En 1979 se creó el Centro de Educación preescolar "Nuevos Horizontes", integrándose en 1985 el proyecto de primaria, como continuidad del programa de preescolar. Proyecto que justificamos bajo los siguientes objetivos a alcanzar.

A) Dar respuesta a la peticion que los padres de los niños de este centro, año con año habian presentado en lo que se refiere a obtener continuidad en la educación de sus hijos.

B) Llevar a termino las aspiraciones del personal docente de este centro en cuanto a continuar con la planeación de objetivos educativos para el nivel primaria en base a la tecnologia que se desprende del análisis experimental de la conducta, y de esta forma establecer conductas precurrentes de un nivel a otro de educación.

Ademas dar continuidad a las investigaciones de corte longitudinal sobre desarrollo infantil, y, poder extender el entrenamiento que se ha venido ofreciendo a nivel preescolar a las maestras de primaria con base en un enfoque real de la problematica que se enfrenta en ese nivel.

C) Ofrecer una Educacion Ambiental integral por medio de un enfoque ambiental-conductual al desarrollo del niño arreglando escenarios de aprendizaje, buscando la preservacion del medio ambiente como una practica cotidiana.

Filosofia

Durante los primeros años de vida es cuando el hombre aprende todas aquellas conductas que serán el pilar de sus relaciones interpersonales en el futuro. Por consiguientes en esta etapa en el desarrollo del hombre, a la par que se promueve su maduración física, deben propiciarsele alternativas de adaptacion a las situaciones que vive; y a futuro, debe proyectarlo para cooperar en los cambios que favorezcan el desarrollo cultural y tecnológico de su comunidad.

La formación para el futuro debe planearse e iniciarse cuidadosamente desde temprana edad ya que se sabe, que en la educacion media y superior los individuos aumentan sus conocimientos, transforman su forma de pensar, se adhieren a alguna ideologia, pero dificilmente cambian su forma de actuar; por lo tanto, la planeacion de un centro educativo requiere en nuestros dias de un serio análisis de las cualidades, habilidades, aptitudes y conductas sociales que puedan facilitar la vision real y la toma de decisiones que ha de enfrentar un niño en etapas posteriores.

"Nuevos Horizontes" al tomar en cuenta el desenvolvimiento del alumno tanto como las caracteristicas y el desarrollo futuro de la sociedad, lo hace a partir del enfoque del analisis experimental de la conducta que como ciencia natural establece que el niño cambia progresivamente como consecuencia de sus interacciones con el medio ambiente. Por lo tanto, este centro, para la seleccion de las experiencias de aprendizaje se basará preferentemente en los hallazgos de disciplinas abocadas a la tecnologia educativa.

Para hacer posible esta vision, en "Nuevos Horizontes" dirigiremos nuestros esfuerzos a:

- Dar un enfoque ecológico-conductual al desarrollo del niño, el cual consiste en arreglos al escenario de aprendizaje que faciliten el contacto con la experiencia en forma directa y el trabajo creativo, ademas de orientarlo a la preservación de su medio ambiente, no como un fin a alcanzar, sino como una práctica cotidiana, ya que se consideró que aprender a sobrevivir y a convivir son conductas claves para las futuras generaciones, ya que en el próximo siglo las soluciones personales de tipo económico serán insostenibles en un mundo inhabitable.

- Integrar a los padres a la comunidad infantil como un recurso para obtener congruencia educativa y el máximo provecho sobre todo en la generalización al ambiente familiar de las conductas aprendidas en la escuela.

- Hacer de Nuevos Horizontes un lugar donde la gente aprenda a trabajar unida, donde la atmósfera general permita que el crecimiento no solo sea del niño, sino que los adultos que lo rodean esten dispuestos a seguir aprendiendo. Promover el respeto mutuo y la interdependencia entre el niño y los adultos.

- Mantener el equilibrio educativo entre libertad y disciplina encauzando estas en forma positiva, redirigiendo la energía del niño antes de que algun problema aparezca.

- Asistir al estudiante en el desarrollo de habilidades constructivas para pensar, solucionar problemas, razonar en forma independiente y aceptar evaluación y dirección en forma responsable.

- Promover actividades físicas que tienen para nosotros dos valores importantes: la primera se refiere al propio desarrollo del niño, y la segunda, a una apropiada canalización de la energía.

- Fomentar el apego a nuestros valores culturales mediante la búsqueda de nuestra identidad como individuos y como mexicanos.

Sistema educativo

El sistema educativo esta encaminado a favorecer el desarrollo del niño dentro de un programa de educación ecológica integral. Las áreas educativas para fines didácticos pueden dividirse en sociales, académicas o cognoscitivas, motoras y creativas, ademas de conceder un lugar importante al lenguaje por estar presente y de ser básico como herramienta en cualquiera de las áreas, enfatizando los conceptos pro-ambientalistas en cada una de ellas, en forma simultánea. Las necesidades de aprendizaje de los niños son separadas sólo para propósitos de planeación y seguimiento.

En "Nuevos Horizontes" como apoyo técnico a nuestro sistema educativo utilizamos las estrategias generales del análisis conductual aplicado que pueden resumirse de la siguiente manera:

1. Especificación de objetivos de enseñanza en términos observables.

2. Inicio de la enseñanza al nivel de competencia del niño pretendiendo la homogenización del grupo.

3. Arreglo de situaciones de enseñanza (escenarios, materiales y actividades extraescolares) para facilitar el aprendizaje centrado en la individualidad del niño.

4. Evaluación constante de los progresos de aprendizaje y flexibilidad hacia situaciones que permitan mayor avance.

5. Implementación de prácticas para el desarrollo de gustos, que generalicen y mantengan conductas mas allá de la escuela.

El hecho de que el análisis conductual aplicado tenga estrategias bien definidas para llevar a cabo sus objetivos, no significa que ya se sepa todo acerca de la enseñanza, o sea que el sistema de instrucción Nuevos Horizontes, no es un sistema cerrado, puede modificarse de acuerdo a la información que nos siga ofreciendo la investigación básica y aplicada, ya que el sistema se basa en conceptos y relaciones definidos objetivamente, asi los cambios, significan revisiones y extensiones, y no abandonos o retrocesos.

Grupos

Nuestros grupos se nutren de alumnos egresados de nuestro programa de educación preescolar, dando preferencia a niños cuyos hermanos esten dentro del proyecto, contemplando un crecimiento escalonado que absorve a los niños egresados del nivel inferior inmediato.

Los grupos constan de una población máxima de 25 niños de ambos sexos, lo cual permite lograr objetivos terminales a la vez que favorece la supervisión individualizada.

Recursos Humanos

Se ha pensado como algo muy importante para el desarrollo del niño en la calidad de los programas educativos, pero lo que hace realmente que la conducta académica sea efectiva es lo que el maestro hace momento a momento con los niños.

Cada grupo cuenta con un maestro titular apoyado por maestros encargados de los talleres (inglés, arte, música, ciencias, ortografía...).

Además se integra a los padres en la actividad escolar buscando congruencia educativa y aprovechamiento de sus conocimientos y habilidades.

Ambiente Físico

Para la realización óptima de este proyecto de educación primaria se ha requerido contar con un ambiente físico congruente con nuestras pretensiones educativas, aulas que permiten trabajo con la dinámica de talleres, así como áreas deportivas recreativas. Fue necesario hacer congruente el ambiente físico que serviría de contexto para que los humanos, los objetos y su interdependencia, fueran armónicos con las condiciones geográficas y climatológicas de la entidad creando estilos de vida que representen a un sonorense que vive en el desierto, no en contra de este.

En lo que respecta al espacio físico del proyecto se rescatan las técnicas que nos llevan a una mejor adaptación con nuestro medio, apoyados en los avances de la tecnología moderna, como el uso del adobe y madera, orientación, dimensión del espacio, ubicación y selección de vegetación; todo esto, para optimizar las bondades que nos ofrece el sol, agua, aire y tierra que finalmente vienen a ser medidas concretas de protección al medio en los renglones de estética, salud y conservación de recursos.

Nuestro centro se encuentra localizado en un terreno urbano de 2,635 metros cuadrados, al sureste de nuestra ciudad.

Vinculacion de programas de servicio y proyecttos de investigacion

Este centro vincula sus programas de servicio con proyectos de investigación tanto de conductas académicas como de desarrollo y mantenimiento de conductas protectoras del ambiente. Las investigaciones pro-ambientalistas nos han permitido desarrollar estrategias que tienden a evidenciar a corto plazo el impacto ecológico de nuestras acciones cotidianas. Se han elaborado programas preventivos y material didáctico que apoye la educación ecológica y que pueda reaplicarse en otros centros educativos, participando maestros y alumnos en el entrenamiento sobre el aprendizaje de contenidos ecológicos

intregrados al resto de las áreas de conocimiento, análisis de las diferentes conductas protectoras del ambiente y la vigilancia del impacto de dichas acciones.

Investigaciones en las que han quedado incluidos los padres para lograr la generalización de las conductas protectoras del ambiente a otros escenarios, esto se logra a través de estrategias de vigilancia de los niños hacia sí mismos y de contravigilancia ejercida hacia otros sujetos que afectan al medio ambiente.

EDUCATIONAL AND PRACTICAL USES OF SOLAR ELECTRICITY

Dr. Robert Vogl
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Abstract

Hands-on experiences with a solar education kit developed to demonstrate the principles and uses of solar electricity: a free, healthy, environmentally sound source of energy for the future. Students explore solar energy through challenges which they meet. Appropriate for grade 4 through adult. Includes slide overview of energy efficient installations.

Introduction

Action is needed now to rekindle our commitment to environmental reforms.

There is a growing belief that fossil fuels and nuclear power are no longer tenable sources of energy for the future of the global environment. The greenhouse effect, acid rain, the Alaskan oil spill and high ozone levels are only some of the environmental costs of our reliance on fossil fuels.

The accidents at Chernobyl and Three Mile Island are grim reminders of the lack of wisdom inherent in trusting human nature to equal the demands of complex technologies.

Constant bombardment of bad news about global environmental deterioration takes its toll on the human spirit-we need an optimistic view of the future.

Solar Electricity--The Optimistic View

Many environmentalists believe that solar electricity provides that optimistic view--along with energy conservation, it can eliminate most of the adverse effects of energy production.

Solar electricity is a healthy, environmentally sound source of power which provides an alternative to the destructive direction in which energy production is now headed.

Producing electricity directly from the sun's energy, it is a non-polluting, free source of energy: there are no moving parts and no emissions.

Current Solar Electric Installations

Currently, solar power is being used to produce electricity for subdivisions in Arizona and California, with long daylight hours of intense sunlight. But it is also being successfully used to produce power for homes in isolated areas in the north. Even during the winter months, it produces all the power needed, except for centrally located freezers and showers, for several families on a cooperative farm in Minnesota.

Solar electricity is also being used for powering RVs and motorboats, for automatic yard and walk lights, fans, display and security lighting, battery charging, radio communications, lighting isolated buildings and restrooms, water pumping, and emergency power.

Educational Uses of Solar Electricity

An educational packet has been developed to demonstrate the principles and uses of solar electricity. It includes equipment: a solar panel, volt and ammeters, lights, motors, buzzers, diodes, and resistors; and over 30 accompanying activities, written as challenges for students to meet rather than as directions to be followed. Challenges are designed to encourage students to work with the equipment in order to learn how solar electricity is produced, what affects the amount of power produced, and how solar power can be used.

The packet and accompanying activities are designed to provide hands-on experiences to help students learn through direct exploration and experimentation. Students will learn about the production and uses of solar electricity, and will be capable of developing practical applications for use in their own lives. It has been successfully used with students from grade 4 through graduate school.

THE GREEN SCENE
(COOPERATIVE LEARNING ABOUT OUR ENVIRONMENT)
UNIT I
"FOREST ECOLOGY AND WILDERNESS"

Kathleen Welsch
Tucson, Arizona

M. Lynette Fleming, Ph.D.
The Wilderness Society
Washington, DC

Abstract

A hands-on presentation of a new environmental education curriculum on forest ecology and wilderness. The unit includes an introductory video and uses cooperative problem-solving or group learning techniques. We will demonstrate the components by leading the audience through several lessons as actual participants in 'solving' the problems.

The long term goal of The Green Scene curriculum is to aid in the development of an American citizenry which exhibits understanding, concern, and commitment to healthy forest ecosystem dynamics and the importance of wilderness areas in protecting the quality of life on the planet. To move toward this goal, a prototype unit of six lessons, Forest Ecology And Wilderness, was developed. It was designed specifically to enhance cognitive learning in major curriculum areas, to encourage cooperative group work, and to promote critical thinking and problem-solving skills. This first unit, targeted for middle school students, includes:

- printed materials with hands-on activities, demonstrations, reading material, and teacher guides; and,

- a video cassette, which uses location film to introduce and reinforce content and provide an interactive component for the children.

The unit was designed to educate both the children and their teachers. We employed these approaches to teaching about the subject for a number of reasons.

- Written materials alone do not accommodate the different ways children (and adults) learn. By focusing on a variety of learning styles (using a combination of written material, hands-on activities, demonstrations, and audiovisual presentations), teaching can be more effective and enjoyable (4,5,13). A unit which presents curricula materials through several modalities will be more effective than a one-medium program.

- More effective teaching occurs when print material is integrated with high-quality audiovisual materials (3,5,9,11,12). Audiovisual materials help motivate reading (4,12) and create emotional impact, enabling students to experience a deeper level of understanding (3,9). The use of video will also allow students and teachers to see things that are not possible to see in print, and help them visualize abstract and complex concepts.

- Group work is an effective teaching tool for the intellectual and social learning goals stressed in elementary grades. It is a superior technique for conceptual learning, for creative problem solving, and for increasing oral language proficiency (2,6,7,14,15)

- Teachers do not feel comfortable teaching an unfamiliar subject or technique, and are rarely motivated to do so (8). Many teachers feel they do not have time to "keep up" with instructional research, methods, and skills (1,8). Teachers do not often get a chance to see other teachers teach as a means to add to their own repertoire of teaching methods or activities, and are reluctant to conduct activities that they have not previously used or seen demonstrated (10).

- Creating an atmosphere in the classroom where students have an opportunity to address environmental issues and solve problems mimics the activity of adult citizens who must make difficult decisions in the "real" world.

CURRICULUM FRAMEWORK. This environmental education unit was built around several major concepts which were developed cooperatively with input from educators, natural resource managers, conservationists, and others.

- All living things are interconnected and interdependent. Humans are an integral part of the environment, constantly affecting it and being affected by it. Humans and their societies are intimately dependent on the environment, including forests. Forests provide many essential goods and services for humans. Wilderness areas provide support for life on our planet.

- Variation and change occur in all ecological systems. Biological systems are dynamic because the energy and materials involved are parts of continuous cycles. A forest is a dynamic community composed of both living and nonliving things.

-The natural environment is at risk from human use, population pressures, pollution, affluence, and direct destruction, which threaten the important resources on which humans and other animals depend. The magnitude of the threat is such that the very ability of the environment to support human and other life is in jeopardy.

-Wilderness areas are special places where natural ecological processes are relatively undisturbed by humans. In this country and others, wild public lands have been set aside and protected for the benefit of current and future generations of humans, other animals, and plants. For humans, these areas offer recreation, wildlife, clean air and water, and scenic beauty.

- There are actions, both social and individual, that can be taken now to prevent the further deterioration of the environment, and even to improve the condition of the environment locally and globally.

DEVELOPMENT OF THE UNIT. The aim of The Green Scene in general and this introduction to forest ecology and wilderness in particular, is to use activities, videotape and printed materials to present specific themes about the nation's forests and wilderness areas to middle school children and their teachers.

The conceptual framework was originally presented to experienced teaching professionals during a curriculum writing conference. In addition to using these themes, the educators were asked to incorporate their extensive knowledge of pedagogy into the development of activity-based lessons for children and suggestions for the printed and video materials.

The printed materials were to include a teacher's guide, and reproducible handouts and worksheets which would reinforce and extend the processes of critical thinking and problem solving that are applicable to all parts of the curriculum, especially language arts, mathematics, science, and social studies. The teacher's guide would contain an introduction to the unit, objectives for each lesson, local applications, and a materials list. In addition, suggestions for thematic units, extensions within curriculum areas, and other activity sources (such as NatureScope, AIMS, OBIS, Project WILD, Project Learning Tree, the USFS Process Approach to Environmental Education) would be provided.

The lessons were organized as a series to help students increase their understanding and think their way through important issues of forest and wilderness ecology. Each lesson was designed to be used individually, however, and not depend on the others for its successful use. As a result, the lessons would be an easily scheduled and flexible means of strengthening instruction in all subjects.

The videotape was structured to cover important content/background information and provide some interactive opportunities for the students. The desire was to employ on-location filming techniques to graphically clarify some of the more abstract concepts.

The interactive portion would include a simulation, where information is provided about a forested area and real-life issues are posed. The tape could then be stopped, and in groups, the children would come up with solutions. Once the groups had made their decisions, they could return to the video to see the impact of their decisions over ten, fifty, or one hundred years.

FIELD TESTING. The materials and activities the teachers developed were edited, used to organize the video, and checked by scientists for accuracy before being put into pilot form. The six pilot lessons comprising the Forest Ecology and Wilderness unit were subjected to extensive field testing prior to the final production and subsequent distribution. A total of 100 prototype units, including printed materials and a one-half inch video cassette, were distributed to classrooms sampled from six regions in the continental U.S.

Evaluation by these pilot classes was initiated in the fall of 1989, in conjunction with the celebration of the twenty-fifth anniversary of the Wilderness Act. Testing on all lessons was completed by mid-May 1990. Based on the field test results, any indicated revisions of the prototype unit were made by the design team, and production began in July of 1990.

UNIT DESIGN TEAM. This environmental education unit was developed by a team of experts led by experienced classroom teachers, environmental and public information specialists and natural resource professionals. A working partnership involving the U.S. Forest Service, The Wilderness Society and the University of Arizona oversees the project.

The current design team includes Terry Daniel, Professor of Psychology and Renewable Natural Resources at the University of Arizona (project director); Fran Sherlock, producer for KUAT-TV, educational television station at the University of Arizona; Lynette Fleming, environmental education curriculum consultant; Kathleen Welsch, The Wilderness Society; Tim McIntyre, video script writer and editor; Rod Replogle, U.S. Forest Service Region 3 public information officer; Kerry Baldwin, environmental education director of the Arizona Game and Fish Department; John Kirk, director of the New Jersey School of Conservation; and one dozen public school professional educators.

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"LAS DIMENSIONES DE LA FORMACION AMBIENTAL"

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Maritza Landázuri[1]

Abstract

The Environment was defined--in a global and interdisciplinary perspective--as the object of study; its problems and alternatives for human survival. Four central concepts were identified: conceptual methodological problems, the articulation human being-nature, the articulation human being-society, and environmental training. We demonstrated the relationship and its connections.

Dada la situación de crisis ambiental en el sentido biológico y social por los que México ha venido atravezando, especialmente desde la década de los 70as, y el incremento que ésta ha llegado a tener a la fecha, surge la necesidad imperiosa de involucrar a los docentes, investigadores y profesionistas a nivel universitario en la inclusión formal de dicha problemática tanto a nivel teórico como práctico en los campos de su quehacer académico y profesional. Esto hace surgir la necesidad de crear esquemas conceptuales que sirvan de punto de referencia para la formación ambiental a todos niveles.

El objeto de esta investigación fue el crear un esquema conceptual que permita definir y organizar los componentes básicos estructurales de la formación ambiental a nivel universitario, tanto para sus planes de estudio, de investigación, de difusión y de servicio.

Antes de elaborar dicho esquema tuvimos la necesidad de definir[2] lo que implica el concepto formación ambiental resultando la siguiente: la FORMACION AMBIENTAL, a diferencia de la educación ambiental[3], implica esencialmente el proceso formal de capacitación académica y de formación psicosocial de personal universitario calificado, proveniente ya sea del campo de las ciencias sociales, las ciencias naturales o interdisciplinario, tanto en sus áreas básicas como aplicadas, para la detección y manejo profesional de los problemas del medio ambiente.

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[2] En la definición de este concepto intervino también el Biólogo Francisco Maradiaga de la Universidad de Guerrero.

Esta concepción de la formación ambiental comprende dos vertientes que son:

a) los procesos para la toma de conciencia global que debe tener todo egresado universitario, de los problemas del medioambiente y de la relación que guardan con el campo de su práctica profesional y,

b) la adquisición de las herramientas propias de su profesión necesarias para poder intervenir preventiva y/o correctivamente sobre ellos.

Igualmente el concepto de dimensión ambiental[4] lo entendemos como el panorama que resulta de una percepción integrada de los problemas básicos relativos al medio ambiente que permite una reorientación y articulación de las diversas disciplinas y experiencias educativas entre sí para presentar alternativas de solución de los mismos.

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[3] que busca prioritariamente la sensibilización de la población a los problemas del medio ambiente, proponiendo alternativas de acción comunitarias.

[4] La definición que proponemos aquí, está fundamentada en parte en ciertos conceptos relacionados con le término en: La Educación Ambiental, las grandes orientaciones de la conferencia de Tbilisi, URSS, UNESCO, 14 a 26 octubre de 1977, pág. 73, recomendación No. 1, inciso 2.

COMPONENTES BASICOS ESTRUCTURALES DE LA FORMACION AMBIENTAL

En el siguiente esquema conceptual[5] se muestra lo que consideramos ser los componentes básicos estructurales para la formación ambiental, así como sus interacciones posibles.

Por limitaciones de espacio no expondremos los contenidos particulares que se desprenden de cada uno de sus conceptos secundarios.

COMPONENTES BASICOS ESTRUCTURALES DE LA FORMACION AMBIENTAL

EL MEDIO AMBIENTE
Análisis de sus problemas
Objeto de estudio: y alternativas para la supervivencia del
ser humano en el planeta tierra.

Conceptos centrales y secundarios:

D.- FORMACION AMBIENTAL
D.1.- Concepciones.
D.2.- Formas de abordaje.
D.3.- Contenidos curriculares.
D.4.- Formación docente.
D.5.- Evaluación de la formación.

A.- ENFOQUE CONCEPTUAL-METODOLOGICO
del objeto de estudio.
A.1.- Debate conceptual.
A.2.- Abordajes metodológicos.

B.- ARTICULACION
SER HUMANO-SOCIEDAD-NATURALEZA

B.1.- La biósfera
B.2.- Recursos naturales.
B.3.- Recursos energéticos.
B.4.- Manejo de Desechos.
B.5.- Salud del ser humano.

C.- ARTICULACION
SER HUMANO-SOCIEDAD

C.1.- Asp. socio-políticos.
C.2.- Asp.socio-económicos.
C.3.- Asp.socio-culturales.

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[5] Uno de los principales autores consultados en cuanto a la metología de construcción para un esquema conceptual fue: Remedi, V.E., 1979. Construcción de la estructura metodológica, en Aportaciones a la didáctica de la Educación Superior, ENEPI-UNAM, México, 1979.

El sistema de codificación en base a letras y números utilizado, está basado en los esquemas de clasificación de la Revista Computing Reviews de 1987[6]. Dicho sistema fue resultado de amplios estudios para obtener una forma de organización temática flexible para actualizarla sin causar desajustes en la codificación.

Como podemos ver, cada uno de los cuatro conceptos centrales a analizar (el problema conceptual-metodológico, la articulación ser humano-sociedad, y articulación ser humano-naturaleza y la formación ambiental) se derivan del objeto de estudio a tratar (el medio ambiente, sus problemas y alternativas para la supervivencia del hombre en el planeta tierra). Tanto los conceptos centrales como los conceptos secundarios en la realidad interaccionan y se determinan unos a otros.

Recordemos que este esquema tiene únicamente como finalidad, proporcionar un instrumento conceptual básico que sirva de referencia para la planificación de la formación ambiental y que permita ubicar en ella el área de estudio o de investigación correspondiente, así como sus relaciones y posibles repercusiones en otras esferas diferentes a la que se está abordando.

Perspectivas

Esta organización de los componentes básicos estructurales de la dimensión ambiental de ningún modo pretende ser exhaustiva, completa o definitiva, sino por el contrario, ser base de discusión y crítica para enriquecerla a través de las opiniones y polémicas que de ella se deriven. Pretendemos que este esquema conceptual faculte al estudiante, profesor, investigador o profesionista en la comprensión de la amplitud y los elementos de la dimensión ambiental, y le otorgue un marco de referencia que la permita ubicarse individualmente dentro de un todo amplio e infinito, y así reconocer y/o prevenir entre otras cosas, las posibles repercusiones del trabajo que esté realizando en esferas diferentes a las que aborda.

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[6] Revista Computing Reviews, volume 28 number 1, ACM, Nueva York, U.S.A., 1987.

IMPLEMENTATION OF THE FOCUS ON FORESTS EDUCATION PROGRAM PROVINCIALLY, NATIONALLY AND INTERNATIONALLY

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Abstract

"Focus on Forests" is a program thatn enables classroom teachers to use forests and forestry as a vehicle for reaching curriculum objectives. A report on the development phase was made at the 1989 NAAEE Conference. Implementation is underway in Ontario and other Canadian provinces and is under consideration in some U.S. states. The various implementation strategies will be discussed.

Introduction

The Focus on Forests education program began as a seed idea in two places at the same time. Staff of Forestry Canada at Petawawa National Forestry Institute began to envisage a project that would utilise forestry as a vehicle for teaching core curriculum. Meanwhile, the Ontario Ministry of Natural Resources had people who where thinking about forestry education as a tool for dealing with many misconceptions about forestry and forest management in Ontario.

The two seeds germinated into a single cooperative development project administered by Ontario Ministry of Natural Resources and funded by a federal/provincial forest resource development agreement.

This paper/presentation will provide the background to the development of the Focus on Forests education program and discuss the implementation strategies adopted to deliver the program within and beyond the province of Ontario.

A Description Of The Material

The objectives of the program are:

1. To provide students with the opportunity to observe and examine trees and forests in the world around them.
2. To develop an understanding of the forest as a complex community of living and non-living components.
3. To develop an understanding of some of the interrelationships that exist among the components of the forest community.
4. To observe and analyze the ongoing processes of change in a forest community and to examine the role of the various agents of change in shaping the forest environment.
5. To develop a general understanding of the concept of responsible forest management and emphasize the importance of the multiple forest values.

It is important to note that the underlying goal of these objectives is not the development of a particular point-of-view, but rather to equip the student with enough skills and knowledge to develop their own point-of-view on a basis of reason and understanding, and to be able to have due regard for other opinions.

Current thinking by educators places at least as much value on the development of skills and attitudes among elementary and secondary pupils as it does on the mastery of a particular body of knowledge.

Trees and forests make an excellent medium in which to develop useful skills and constructive attitudes. For these reasons, the Focus on Forests project uses many of the pedagogical approaches expressed in Ontario curriculum documents.

These approaches include viewing the student as an active participant in education--a self-motivated, self-directed problem solver. The activities and lessons throughout the program provide the opportunity for active involvement in the important dynamics of learning. These dynamics include observing, sensing, inquiring, creating, analysing, synthesising, evaluating and communicating.

The program consists of an activity guide for the primary and junior grades (K-6) and a resource manual for the intermediate and senior grades (7-university preparation). The manuals are printed on recycled paper, are hole punched and perforated allowing the user to burst the material and store in a binder. The manuals are available in French and English.

Both manuals adhere to the same philosophy and have some commonalities as well as the expected differences.

At an appropriate level, material in both manuals examines characteristics of trees, explores forest ecosystems and discusses human relationships with the forest. Both manuals are intended to be "teacher friendly", so that preparation time is minimized and flexibility is maximized. A standardized format is used throughout. Most importantly, all activities and lessons connect directly to the Ontario provincial curriculum as identified by the Ontario Ministry of Education.

Specific format differs between the two manuals. The **Primary/Junior** manual contains a series of **activities** appropriate to a range of grade levels. Each activity has an objective statement, a thumbnail listing of logistics information, an activity outline and any necessary background, teaching notes or activity sheets.

The **Intermediate/Senior** manual contains a series of **lesson outlines** designed to help address the requirements of the Geography, Science and Environmental Science curricula at various grade levels. Each lesson has a complete outline, required background information and a resources list. The lessons are not sequential and can stand on their own or alternatively selected lessons can be assembled into a complete 15 hour unit.

Consequently, the teacher has flexibility in using the program. Lessons can be used to supplement an existing program, developed into an entirely new program, or, the teacher can use a suggested unit identified in the manual. The teacher, therefore, has the ability to build a program of study to suit his or her particular needs using elements of forestry and other relevant components.

Implementation In Ontario

The program is available to users through attendance at workshops. This method of implementation, modeled after the successful approach taken throughout Canada and the U.S. by the Project WILD, ensures efficient and effective use of the program. Through participation in the workshop, program users have the opportunity for demonstrations, practice and feedback using the resource material. The material is no longer unfamiliar to them and so it is easy to use the activities with their students. Furthermore, the decision on the part of an educator to invest time into attending a workshop strengthens the commitment to subsequently use the program.

Two levels of workshops are available. The objective of the three day **leader workshop** is to train educators and resource specialists as program leaders who will train future program users (e.g. teachers and youth group leaders). Participants only pay for meals and accommodation. There is no charge for the workshop or manuals.

The role of these leaders is to train educators how to effectively use the program with their students or youth groups during the six hour **user group workshop**. The leaders work in teams consisting of:

Resource specialist:	primarily from MNR and Forestry Canada staff with strong forestry or ecology backgrounds; and,
Education specialist:	educators, particularly curriculum consultants, environmental education teachers or classroom teachers with a knowledge of and/or interest in forestry.

There are considerable challenges in undertaking the workshopping method of implementation in a jurisdiction like Ontario. The objective of the implementation is to ensure that there are leaders in all school boards who are willing to deliver user workshops to their colleagues. The resource leaders are also required to be available to meet the demand for workshops to form the other half of the delivery team.

The province of Ontario has an area of over one million square kilometres. The majority of the population is centred around the "Golden Horseshoe" on the western end of Lake Ontario. Over half of the provinces teachers are found in this area within one of the 47 Ministry of Natural Resources' administrative districts. The challenge is to meet the demand for workshops created by the teachers in this area. Conversely, the population density in northern Ontario is extremely low and isolated. Many of these teachers must travel long distances to attend workshops.

Current Statistics

Five leader workshops have been held from November, 1989 to May 1990 resulting in the training of 250 program leaders across the province. Many of these leaders have held user workshops which have trained over 1100 program users. (Statistics as of May 1, 1990).

Another five leader workshops, including a francophone workshop, are scheduled to the end of the 90/91 fiscal year. With this schedule, it is expected over 450 program leaders will be in place by the end of this fiscal year.

The program will undergo an internal evaluation in two years and an extensive, external evaluation in five years.

Implementation Potential Outside Of Ontario

The objectives and pedagogical approach of Focus on Forests are valid across North America, in tune with increasing awareness of environmental responsibility, and current developments in the education field. In most areas, the demand for material such as the Focus on Forests program is so great that if this particular program is not utilized a parallel project will likely be developed.

As much as Focus on Forests fills a necessary niche, it cannot be applied outside Ontario without adaptation. Geographic, institutional, species and curriculum references are specific to Ontario. Trying to fit and adapt on an ad hoc basis would be an unwieldy and time consuming process, something that the project development tried to eliminate. Therefore, if Focus on Forests is to used outside of Ontario it must be adapted to the local situation.

Focus on Forests is not a commercial enterprise so there are no fees for its' use. However, the creators of the project are very anxious that it yield maximum value wherever it is used so there are some definite requirements for access to the material outside of Ontario. The basic requirements are listed as follows:

1. The material must be adapted to fit provincial/state/territorial needs.

2. One group in any jurisdiction will be authorized to carry out the adaptation.

3. The adapting group are also required to develop an acceptable implementation strategy. Resource libraries are full of excellent material that has never been used.

4. Adapting groups are required to adhere to a set of guidelines that are designed to protect the original philosophy of Focus on Forests.

Focus on Forests is an excellent example of the potential of cooperative projects. Further cooperation between groups, government and non-government should greatly increase its' value.

"GORILLA" TACTICS IN THE CLASSROOM: TEACHING ENVIRONMENTAL ACTIVISM

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This multimedia presentation describes a comprehensive curriculum that instills environmental concern through an indepth study of endangered mountain gorillas and their endangered rainforest habitat. Turning awareness into action is stressed by involving children in fundraising, letter-writing, petitioning, boycotts and public education forums.

SELF, SOCIETY, AND THE ENVIRONMENT: A COURSE FOR THE '90S

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Abstract

Values and Choices, Bentley College's premier values--clarification course, has been redesigned to reflect Leopold's 3-step ethical progression. After a general examination of values, constraints, and power, subgroups focus on one of the following: 1) personal relationships, 2) democratic organizations, 3) environmental responsibilities. The course concludes with various synthesizing exercises.

For several years one of the most unusual and popular courses at Bentley College has been an interdisciplinary course entitled "Values and Choices." Bentley is primarily a business school. Most students come to earn degrees in Accountancy, Finance, Marketing, and Management. At the same time, they take a surprisingly large number of non-business courses, for fully 45% of their work must be in the traditional arts and sciences. Values and Choices was created to address Bentley's broad curricular interests.

Conceived some 10 years ago by a member of the Philosophy Department, ID 301--as the course is identified in the school catalogue--attempts to bring about several syntheses: classic thinkers and contemporary concerns, liberal learning and business perspectives, textual analysis and interactive experience. Indeed, since the course is team-taught (one philosopher plus another liberal-arts instructor as well as a business instructor), different disciplinary points of view and emphases are built into its very structure. This blend of elements has proved to be attractive, and from the very beginning the course has regularly filled to capacity.

I first began teaching Values and Choices 6 years ago. By that time some of its original texts had been replaced, but its basic structure remained intact. That structure consists of 4 interrelated, indeed, interlocking units: 1. Personal Values Clarification; 2. Social Constraints and Opportunities; 3. Power; 4. The Good Society: Utopian Projections. All three instructors team-teach the first 3 units (8 weeks), sometimes jointly leading discussions, sometimes presenting individual mini-lectures, sometimes breaking into 3 small groups each led by an instructor. However, the fourth unit (6 weeks) consists solely of small group work--three utopia projects resulting in three presentations to the class as a whole.

During the first few years of my affiliation with Values and Choices, I had experimented with a variety of utopia projects, but all had had in common an emphasis on man-nature relations. Last summer I decided to bring my interest in this connection directly into the environmental here and now. I called my new utopia a "Green Utopia," and in it I attempt to introduce students not only to a philosophy of nature but also to the magnitude of the current environmental crisis.

The unit begins with an exploration of environmental attitudes--or, more precisely, the assumptions underlying environmental attitudes. Using a few short case studies I help participants recognize the unstated beliefs that both govern and "justify" common environmental practices. I then review with them aspects of our Western cultural heritage that may have helped promote these beliefs: the transcendent nature of the Judeo-Christian god, the notion of human pre-eminence, Aristotelian schematization, etc. I also review with them relevant aspects of other, non-Western cultures, especially Native American philosaphies. My goal throughout this process is to help them appreciate the relativity of environmental attitudes, the fact that they are not immutable givens but are susceptible to historical and cultural change. In other words, if destructive attitudes can be identified, they can also be reformed.

This philosophical inquiry prepares the way for the unit's second phase: an identification of the current environmental crisis. Actually, students have been working on this phase since the very start of the project, though now it moves to center stage. For all participants belong to a work group responsible for investigating and preparing a presentation on either water, air, or atmospheric pollution or on problems of trash and waste disposal. These presentations are of an introductory nature and are primarily aimed at acquainting the group with the broad outlines of the current crisis. Students are encouraged to utilize whatever marketing skills they've developed to enhance their presentations' effectiveness.

At this point it is easy for students to feel overwhelmed by the magnitude of the crisis. Fortunately, the "power" section of the course provides several models and vehicles for moving beyond a daunting status quo. Building upon this earlier work, the third and final phase of the unit drives students in the direction of personal action: concrete involvement as an antidote to paralysis. Each participant is required to 1. investigate the landfill capacity, waste removal costs, and recycling efforts in his/her hometown; 2. write a letter to the editor of either a hometown, local, or campus paper advocating some environmental position; 3. keep a "trash journal" in which he/she identifies not only the kinds of daily trash he/she produces--but also what kinds of adjustments he/she would make if personally responsible for disposing of all such trash; 4. participate in and report on some environmental event, such as a conference or a rally; 5. work with the other members of the green group to identify and implement one concrete environmental improvement on campus.

Given the practical bent of most Bentley students, I consider this third phase especially important not only in making the project material "real," but also in giving participants some preliminary experience in becoming part of "the solution." During this third and final phase, we also use classroom time to investigate such topics as alternative technologies, recent business initiatives, and employment opportunities in environmental management. (If possible, I invite a guest presenter from a local corporation that has shown environmental initiative.) As its two final tasks, the group prepares a practical environmental "action sheet" for general class distribution and a 30-minute presentation that will help the other two utopia groups understand its work.

At this point the success of the "green unit" has been considerable. Participants regularly claim it has changed their lives, and, indeed, several have actually changed their career plans as a result of this experience. At the very least, they become enthusiastic bearers of the environmental message, sharing--and sometimes even enforcing--the practical lessons they have learned with their peers and families. To no small extent I regard this success as a function of the larger pedagogical framework in which the unit is embedded. After all, our environmental investigations have been preceded by 8 weeks of work on personal values and choices. Hence, it is not surprising that one recent course participant, himself an Environmental Science major, should have written in his final paper:

> As an environmental Science major, my classes have taught me a lot about the conservation, pollution, protection, etc. of our environment. I've learned the technical reasons behind why problems exist...However, I had not been exposed to concepts such as why some people exploit the Earth, what their reasons are...or how ways of thinking can have an effect on what actions people take....I have now been able to incorporate many different ideas into my education, and thus I am even better prepared for life after college.

Indeed, it is not just on student participants that the green unit has had a formative influence. It has also helped enhance the cohesiveness and effectiveness of Values and Choices as a whole. Originally, the course's three utopia projects were conceived of as completely independent. Thus, while I explored a topic related to nature, my two colleagues focused on 1. personal transformation and 2. substantive democracy. The only thing these projects had in common was their attempt to design a society in some way significantly better than our own. Last year, however, early in my preparation of contemporary environmental material, it occurred to me that the three-part ethical sequence Aldo Leopold lays out in A Sand County Almanac (individual-individual relations, individual-society relations, individual-environment relations) closely resembles the trio of utopias we were now offering in the fourth unit of Values and Choices. To further enhance the conceptual and ethical value of the course, I suggested to my colleagues we make this parallel deliberate. They agreed. Henceforth, instead of presenting our utopias as unrelated investigations, we would encourage students to see them as intrinsically linked stages of human awareness. Furthermore, by comparing syllabi we could identify those places where each of us could cross reference his/her points. Finally, we redesigned the course's final assignment to encourage extensive conceptual integration of the three projects.

Thus, environmental awareness has become a major aspect of Bentley's premier values clarification course. Since the attitudes of America's corporate managers will play no small part in shaping our country's environmental future, I am pleased that this is so. I can only hope that other institutions of higher learning--regardless of their orientation--will also find ways to incorporate a "land ethic" into their program of ethical and conceptual education.

STRAND IV: Non-Formal Programs in Environmental Education

ECO-ACT: LIVING ON THE RIVER...

Barbara Addelson
Missouri Botanical Garden

Lydia Toth
Shaw Arboretum
St. Louis, Missouri

ECO-ACT is a high school environmental leadership program sponsored by the Missouri Botanical Garden. This year long program begins with a 3 week summer program focusing on investigation of the urban and natural environments and development of leadership and teaching skills. We will share our experiences in facilitating 1st hand learning about ecology and further development of leadership skills.

"UNA METODOLOGIA MULTIFACETICA: SU APLICACION EN MEXICO, COSTA RICA Y EL REINO UNIDO"

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Abstract

In 1983 a methodology based on the development stages of the human being was designed. Its main objective is to motivate positive attitudes toward nature. I will describe the educational concepts on which this methodology is based. I will show how this methodology has been applied in 4 contrasting situations in Mexico, Costa Rica and the United Kingdom.

Cada vez es más urgente crear metodologías o modelos que puedan aplicarse - con ligeras modificaciones - en una amplia gama de condiciones. Es importante desarrollar metodologías que sensibilicen y motiven actitudes positivas hacia la naturaleza. La educación ambiental es una herramienta indispensable para despertar en los individuos una clara conciencia sobre la problemática ambiental y ofrecer alternativas para su resolución. Un ejemplo de esto, lo constituye la metodología que en este trabajo describiré, la cual ha sido desarrollada, con buenos resultados en 4 lugares con características contrastantes. Esta metodología se aplicó en los 4 casos en forma de cursos sobre distintos temas, y se dirigieron principalmente a niños y adolescentes de 4 a 18 años.

Sitios de Estudio

Los lugares en los que he aplicado esta metodología presentan las siguientes características: Un zoológico dentro de un área tropical natural de un país en vías de desarrollo, Zoológico Regional Miguel Alvarez del Toro (ZOOMAT), Chiapas, México; un zoológico de un país desarrollado, Jersey Zoo, Reino Unido; una comunidad rural moderadamente favorecida, Cóbano, Costa Rica; y en una comunidad rural, menos favorecida, que se encuentra dentro de un Parque Nacional, Lagunas de Chacagua, Oaxaca, México.

La Metodología

Señalaré los lineamientos generales y los fundamentos pedagógicos que han sido la base de la metodología.

La metodología que se diseñó se basa principalmente en considerar el desarrollo de 3 aspectos en el individuo:

1. El desarrollo evolutivo.

Es importante enfatizar que durante la primera infancia, la pubertad y la adolescencia existen diferencias individuales de tipo social, afectivo y psico-motoras, muy grandes. De aquí la importancia de efectuar actividades en base a las inquietudes y necesidades de cada individuo. El educador debe tomar en cuenta la capacidad del niño para ver cosas y fenómenos, y en base a ello diseñar un programa educativo.

Otro factor que se debe tomar en cuenta para el diseño de un programa educativo es la situación socio-cultural y económica de cada individuo. El medio ambiente en el que se desenvuelve cada individuo es un factor determinante para su desarrollo.

2. El desarrollo de la imaginación y creatividad.

Estimular la creatividad e imaginación en cada individuo a través de diferentes técnicas, permite un sano desarrollo físico y mental, además de ser un excelente medio de comunicación. El educador debe ser capaz de seleccionar de acuerdo a la edad de los niños, la actividad más conveniente para su desarrollo.

3. El desarrollo de la curiosidad y de la observación.

Es muy importante satisfacer la curiosidad del niño y encauzarla tanto en el aspecto racional, como en el aspecto creativo. Existen un sin número de actividades que bien orientadas estimulan el ejercicio de la observación a la vez que pueden transmitir conocimientos.

Traduciendo estos tres aspectos en el lenguaje del diseño y la elaboración de un programa tenemos lo siguiente: Tomando en cuenta las diferencias individuales se diseñan planes por grupos de edad, por ejemplo, para los niños de 4 a 7 años las actividades que se desarrollan se concentran principalmente en el juego. Mientras que las actividades para los niños de los 8 a los 11 años se enfatizan en el desarrollo de la curiosidad y de la observación. Un ejemplo son las fichas didácticas que además de divertir y entretener al niño, le proporciona valiosa información sobre temas particulares, además de fomentar el espíritu de cooperación. Las actividades para el grupo adolescente se concentran en la resolución de problemas en los que participan de manera activa. Un buen ejemplo de estas actividades son las dramatizaciones o representaciones teatrales, estos ejercicios resultan ser un excelente medio para la reflexión.

Estructura de los grupos de Trabajo

Otro aspecto importante que considera esta metodología es la estructura de los grupos de trabajo. Basándonos en la teoría de la educación personalizada, que consiste en brindar una atención individual y personal al individuo, con el fin de proporcionarle una mayor seguridad y confianza en su aprendizaje; se decidió que el número de niños por día, que debiera ser atendido no se excediera de los 25. Ya que es más importante brindar una mejor calidad en la atención individual de cada niño.

Se recomienda que la formación de grupos de individuos debe ser integrada por individuos de una sola edad.

Adaptaciones a la Metodología para las características y necesidades particulares de cada sitio.

1. Versión y estilo local del idioma.

Para cada caso el lenguaje que se utilizó fue diferente. A pesar de que en 3 de los lugares en donde se desarrolló esta metodología el idioma oficial es el español, fue necesario aprender la variante local del idioma para lograr una comunicación efectiva. En el caso del zoológico de Jersey, todo el trabajo se diseñó y se realizó en inglés.

2. Adaptación del programa a la vida cotidiana.

Fue muy importante, sobre todo en las comunidades, el haber permanecido durante el tiempo del programa educativo, conviviendo con la comunidad, e involucrarse en el desarrollo de distintas actividades. Esto permitió una interacción más efectiva entre el programa y la comunidad. Por otro lado nuestra presencia en un lugar donde no hay demasiadas distracciones, proporciona cierta novedad a la cotidianidad.

3. Partir del nivel cultural y socioeconómico.

Debido a la heterogeneidad de los casos, el diseño de materiales y actividades se elaboró tomando en cuenta el nivel educativo y las condiciones sociales y económicas de cada lugar, así como de sus necesidades perticulares.

4. Desarrollo de actividades y selección de los temas.

Una vez más variaron mucho las actividades entre cada lugar. Mientras que en Chacagua, México se realizaban actividades con materiales locales, y el tema central eran las tortugas marinas, en Cóbano, se utilizaron fichas didácticas, apoyando el tema del venado cola blanca, principalmente. En el caso de los zoológicos se aprovechó la amplia gama de recursos didácticos que representa la colección de animales.

5. Materiales y/o equipo de apoyo didáctico.

Para todos los casos se procuró siempre utilizar materiales que pudieran conseguirse fácilmente. Favoreciendo que fueran de segunda mano, o reciclados, con la idea de motivar un uso más eficiente de los recursos. Lo importante era evitar crear necesidades en los niños, sobre todo en el caso de las comunidades. Según el lugar se pudo contar con diversos materiales desde poco y simple, hasta microscopios y videos.

6. Tiempo disponible por los educadores.

Debido a que el programa en ambos zoológicos se desarrolla en periodos vacacionales es difícil involucrar a los maestros. En el caso de la comunidad de Chacagua fue imposible trabajar con los maestros, mientras que en Cóbano si se pudieron realizaron algunas actividades con ellos.

Considerando los puntos antes mencionados, y otros, como la disponibilidad de recursos humanos, financieros y materiales, la metodología descrita en este trabajo, puede tener buen éxito al ser aplicada a otros lugares.

Evaluación

Uno de los puntos más difíciles en programas de educación ambiental son las técnicas para evaluarlos objetivamente.

Un resultado positivo de esta metodología ha sido la continuidad de los programas en las diferentes áreas de estudio. Puedo señalar, por ejemplo, que en el caso del ZOOMAT, en Chiapas, México, han transcurrido ya 7 años, en los cuales hemos podido detectar cambios de actitud positivos en los niños y adolescentes que han participado. Este seguimiento se ha podido llevar a cabo, gracias a la participación de los padres, quienes nos informan del comportamiento del niño, en casa y fuera de esta. Otra forma de evaluar esta metodología, ha sido a través de un análisis realizado con el personal que ha colaborado, en el cual se discuten algunos aspectos, tales como:

1. El contenido de los temas fue asimilado?
2. Qué tan atractiva fue la presentación de los temas?
3. Es necesario utilizar otro tipo de material didáctico?
4. Qué problemas se presentaron al realizar la actividad manual?
5. Cómo se desarrolló el trabajo en pequeños grupos durante el recorrido?

Este análisis se lleva a cabo a través de una dinámica participativa. A través de resultados obtenidos se califican diferentes acciones y se realizan cambios. Desde que se diseñó esta metodología (1983), a través de los años, se han hecho modificaciones a la estructura y organización de la misma.

Características del Educador Ambiental

En esta metodología es muy importante la participación dinámica del educador. Para que ésta pueda aplicarse en cualquier situación con éxito, y se garantice e incremente su efectividad, es necesario que el educador presente las siguientes cualidades y/o habilidades:

1. Tener un conocimiento básico sobre pedagogía.
2. Tener un conocimiento sobre biología, historia natural, o en particular del tema que se trate.
3. Tener un conocimiento sobre la problemática ambiental.
4. Saber diseñar un programa educativo (recomendable).
5. Tener nociones sobre didáctica.
6. Ser creativo y muy dinámico.
7. Tener iniciativa.
8. Tener habilidad para manejar grupos.
9. Tener don de mando.

10. Tener facilidad de palabra.
11. Tener capacidad para improvisar
12. Tener disponibilidad para el cambio
13. Tener honestidad para reconocer limitantes.
14. Saber trabajar en equipo y tener espíritu de cooperación.
15. Ser alegre y entusiasta.
16. Estar convencido del propósito conservacionista.

Recordemos siempre que la labor de un educador es trascendental para la vida de sus educandos.

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MISSOURI CONSERVATION FRONTIERS--A CONSERVATION ACTION PROGRAM

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Missouri Conservation Frontiers, newly revised, provides a system of activities and awards for all Missourians. The activities emphasize the conservation of natural resources, most projects dealing with renewable resources--wildlife, fish and forests. The program can be adapted and utilized by families and youth groups.

UNIFORM AIR QUALITY TRAINING PROGRAM

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Abstract

Uniform air quality training has long been an objective of many of California's local Air Pollution Control agencies. A "Master Plan" was needed to consolidate training resources and to develop training curriculum that could address the common needs of all the agencies involved. The development of the Uniform Air Quality Training Program and the progress that has been made towards implementation will be discussed.

Introduction

One function of the Compliance Division of the California Air Resources Board is to evaluate the adequacy of inspections performed by local APCDs and the associated training programs for inspectors. While performing these audits, Compliance Division staff have noted varying expertise in the performance of source inspections and in training. In fact, only California's two largest APCDs, the South Coast Air Quality Management District (SCAQMD) and the Bay Area Air Quality Management District (BAAQMD), have formal inspector training programs.

In October 1986, representatives of the SCAQMD, the BAAQMD, the San Diego County Air Pollution Control District (SDCAPCD), the Environmental Protection Agency (EPA), and the ARB met to discuss the adequacy of inspector. Those attending that meeting reached the following consensus: A master plan was needed to consolidate training resources and to develop a training curriculum that could address the common needs of all agencies.

To develop and implement this plan (subsequently called the "Uniform Air Quality Training Program"), a task force was formed comprised of the agencies already noted and several other agencies.

This paper will discuss the objectives and direction of the Program, courses being developed, how testing and grading are accomplished, how APCDs are kept informed of the Program, and what will be accomplished in the future.

Objectives of the Program

In November 1986, the Task Force established the following objectives for the Uniform Air Quality Training Program (UAQTP):

1. Set the minimum level of training that should be provided to the inspector.
2. Establish a standardized core course program.
3. Develop multimedia courses such as videotape and correspondence courses.
4. Coordinate local APCD training programs with the federal and State training programs.
5. Obtain continuing education unit (CEU) accreditation for all courses.
6. Develop training programs for both entry level and continuing education.

To achieve these objectives, the Task Force also outlined the basic near-term direction for the program: (1) identify the Program's core courses; (2) identify the format for the courses and how they would be presented; (3) obtain funding for course development; (4) obtain statewide acceptance of the program; and (5) develop and implement the courses. The details in implementing this direction are as follows.

Courses Identified for the Program

Courses to be developed were separated into three categories: 100 Series courses for entry level information, 200 Series for journey-person information, and a 300 Series for specialty information. Course selection for each series was based on input from each Task Force member after discussion with management staff in her or his agency. The courses were selected if it would answer the question, If you started work today as a air pollution inspector, what are the very basic principals that are needed for the job?

Entry Level (100 Series) Course Identification

Sixteen basic courses were identified and are as follows:

101 History of Air Pollution
102 Climatology and Meteorology
103 Classification of Air Contaminants
104 Safety Training
105 concepts of Regulation Development
106 Interface with Related Agencies
107 Report Writing and Investigative Technique

108 Compliance Inspection of Basic Air Pollution Control Equipment
109 Evaluation of visible Emissions (VEE)
110 Complaint Response Procedure
111 Sample Gathering and Integrity
112 Conceptual Chemistry and Physics
113 Inspector Conduct and Liability
114 Evolution of Environmental Law
115 Monitoring Concepts
116 Communication Skills

As soon as these courses are developed, inspectors will be encouraged to complete them within one year. Ideally, this would include both experienced and new inspectors.

Journey Person Level (200 Series) Course Identification

Twenty-nine course topics have been identified so far. The 200 Series will be more focused than the 100 Series curriculum, and will need repeating at regular intervals. The current 200 Series course list is as follows:

200 VEE Training
201.1 VEE Night Orientation
201 Source Test Orientation
202 Records Review Techniques
202.1 Alternate Emission Control Plans and Compensating Reduction Records
202.2 Continuous Emission Monitor Records
202.3 Ground Level Monitoring Records
202.4 Computer Operations Up-dates
220 Policies and Procedures
220.1 Inspection Field Policies and Procedures
220.2 Administrative Policies and Procedures
230 Laws, Regulations, and Rules
230.1 Review of Existing Laws, Regulations, and Rules
230.2 New Laws, Regulations, and Rules
230.3 Changes in Laws, Regulations, and Rules
230.4 Interpretations of Laws, Regulations, and Rules
230.5 Related Agencies, Laws, Rules, and Regulations
231.1 Paints and Coatings Compliance
250 Safety Training
250.1 Driver Safety
250.2 Breathing Apparatus
250.3 Protective Clothing and Emergency Equipment
250.4 Fire and Explosion
250.5 Hazardous Materials and Toxic Emissions Up-dates
250.6 First Aid
260 Portable Analyzers
260.1 Volatile Organic Compounds
260.2 Hydrogen Sulfide

260.3 Sulfur Dioxide
270 Report Writing

Specialty (300 Series) Courses Identification

Currently, the 300 Series course list has not been identified. We anticipate that the list will include specialty courses for inspectors working in very specific areas (i.e., source testing, refineries, etc.) The 300 Series will require completion of the 100 Series courses as prerequisites.

Format and Presentation of Courses

Training is being done using video tapes developed in a modular fashion ("modular" means separated into chapters or segments). An ARB person or designated surrogate will be in attendance to answer questions and to administer the test at the end of the viewing. The video tapes are being constructed with breaks every 15 to 30 minutes.

Funding of Courses

EPA has provided the "seed" money for the development of the 100 Series courses in two $50,000 allocations. EPA has also provided an additional $50,000 to fund a person to work solely on the UAQTP. The ARB was asked to provide the office space, travel expenses, and office supplies for that person.

Course Development and Implementation

100 Series Courses

Material for the 100 Series courses is being developed by a contractor, with the ARB serving as manager and reviewer of the developed courses. After going through a bidding process, the Task Force contracted with Eastern Technical Associates for course development for five modules. California Polytechnic State University received the contract for the course development for four additional training modules.

Five videos are presently available. Training Modules 102 "Climatology and Meteorology," 104 "Source Inspection Safety Procedures," 113 "Inspector Conduct and Liability", 114 "Evolution of Environmental Law" and 101 "History of Air Pollution" are completed. Each course consists of a video, a student workbook, and an exam.

200 Series Courses

Full development and implementation of the 200 Series courses is many months away. However, one 200 Series course (231.1, "Paints and Coatings") has been developed to help inspectors determine compliance of sources where paints and coatings, including solvents, are used. Over a hundred individuals, representing a dozen agencies, completing course requirements.

300 Series Courses

No specific courses have yet to be identified.

Administration, Testing and Grading

Guidelines were established to provide for the administration of the Program and for the testing and grading of persons taking the developed courses. As agreed, ARB will oversee the administrative responsibilities associated with the development, presentation, testing and grading of all UAQTP courses. ARB will deliver the course material to all APCDs for the first round of training and each newly developed course. This personalized visit will provide the opportunity to explain the origins and purpose of the UAQTP as well as receive direct feedback on each course. The tests will be graded on a pass/fail basis. A score of 70 percent or greater will be considered a "passing" grade. Once the exams have been graded, individuals with a passing score will receive a Certificate of Completion in recognition of their demonstrated mastery of the course material. Those who do not pass the test will receive a letter encouraging them to review the course material and take a make-up exam.

Continuing Education Units

Historically, the Compliance Division has received CEU accreditation for its training courses from California State University. We expect to submit a request for CEUs shortly for the first five 100 Series courses.

Air Quality Training Newsletter

The Task Force decided that a medium was needed (1) where California air pollution control agencies could learn of the training programs currently available, and (2) where local district training needs and ideas could be discussed. The Air Quality Training Newsletter was subsequently developed by the ARB's Compliance Division to meet these needs. The ARB publishes the Newsletter quarterly.

Future of the Program

The future of the Uniform Inspector Training Program is very promising, but much work remains. Development of the 100 Series course material is expected to be completed by the end of 1990. Subsequently, development work will focus on 200 Series courses, but no timeline for completion has been set. Concurrent with 200 Series development will be the creation of a 300 Series course list.

Once all three levels of courses are in place, a permanent steering committee will be established. This steering committee will meet periodically to contribute new ideas and changes so that the program will continue to be dynamic.

Conclusions

The objectives originally set by the Task Force are almost completed. Parts of the Program developed thus far have had a positive start and continue to be supported by the agencies involved. In addition, the courses developed are standardized yet flexible enough to be useful to staff of large and small APCDs alike. Moreover, training has been taken off the agencies' back-up tables and been made a priority. This alone is a substantial move in the right direction.

ESTABLISHING AN ENVIRONMENTAL EDUCATION CENTER

Giannina Castillo Cadena
Mauro Roldan Ortiz
Mexico, Distrito Federal, Mexico

Tlalpan forest is a 250 hectars green area, in which several endemic plant and animal species live. It is an important recreation place with infrastructure to serve the public. This could easily become an important environmental education center.

A NON-FORMAL ENVIRONMENTAL EDUCATIONAL PROGRAM FOR THE TEXCOCO LAKE

Ma. Teresa Chavez Cortes
Lillian Carreon Fernandez
Mexico, Distrito Federal, Mexico

This program proposes to develop environmental ethics in urban people. An artifical lake near to Mexico City provides educational tools for supporting the following objectives.

-Teach wildlife conservation
-Teach regional and traditional natural resource use
-Teach management of hidrological basin
-Teach techniques for reuse of water resource.

Note: La Presentacion se hara en espanol.

NEW-THE WORLD PEACE UNIVERSITY FIELD GUIDE TO CONNECTING WITH NATURE: CREATING MOMENTS THAT LET EARTH TEACH

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Abstract

Backyard or backcountry, this self-empowering technology's lively activities evoke and strengthen 53 natural senses which interconnect and balance Nature within and without. Learn its theory and applications. For fun, growth and profit gain personal access to elements which enable Earth to organize, perpetuate and regenerate itself.

Integrated Ecology: Frontier of the Nineties

Astonishment often crosses the faces of those discovering that the closest wilderness to them lies within them. Through our culturally bigoted glasses we seldom see that biologically we are each a seamless continuum of Earth's wilderness relationships. All of our talents and attributes originally grew with and through the global life community over the eons. Within us is the whale's intelligence, the coyote's persistence and the redwood's endurance. Each of our inherited tendencies--kindness, sensitivity, law, honesty, courage--pervade the natural world which grew us. Yet, we seldom honor the natural world for its contribution to human beings.

Modern problems result from the difference between how Nature works and the way we think. Within us an ancient misguided belief pervades: "To survive, we must conquer, improve and develop Nature." That bias postures every aspect of modern life. It leads us to live over 95 percent of our life indoors. Here, isolated from normal signals and callings of the natural world, our knowledge of Nature mainly consists of words which we hang on our indoor living rationality. Globally, the destructive effects speak for themselves.

Words and rationality are but two ways of knowing. They seldom convey the whole. We know a labeled entity by its label's meaning, not necessarily by the entity's role in the global ecosystem. This division creates dualistic consciousness. We seldom recognize "board feet" and "life community" as synonyms.

The science of Ecology temporarily circumscribes our duality. Ecology attempts to discipline modern thinking into studying the relationships between entities rather than entities as objects in themselves. But dualistic habits overpower. Today we know the world through social ecology, plant ecology, wildlife ecology, deep ecology, pond ecology, human ecology, soil ecology, et. al. Each usually labels and cubbyholes. Each assumes importance, further subdividing Nature's peaceful perfection.

A new approach, Integrated Ecology, holistically encompasses all ways of knowing.

1. It acknowledges that how we know is often what we know.
2. It recognizes that people are part of the global life system and in order to be part of a system one must in some way be in communication with the system.
3. It respects that people know the world through many senses for that is how the natural world knows itself.
4. It develops means to strengthen the natural senses.

Integrated Ecology sees people as part of Nature's flow. For example, as it does in all organisms, water from the environment flows into our personal being, through us and out of us. During this process, neither an excess nor shortage of water enters or leaves us. Some sense prevents water from bloating or dehydrating us. Sensitive natural regulators guide water through us.

Water exemplifies our total ecology. Like water, the total environment flows in and through us. Every few years over 95 percent of our body is replaced molecule by molecule, atom by atom by new molecules and atoms from our surroundings; not too many, not too few, just the right amount for our lives to flouris and global life to continue flowing. Every seven years or so we are completely replaced by the environment. It becomes us, we become it. We might define death as a time when the flow stops, when we become the environment permanently.

The sense which regulates and balances water is thirst. Surprised? Don't be. How often we lose sight of our sense of thirst and of many other senses and feelings as well. We lose sight of them because they are Nature. People did not inent thirst or any other sense. Nature invented them and Nature is the bad guy, the enemy. Senses are in Nature's camp. Most four letter swear words are Nature.

Senses however, are life. Contrary to Descarte's "I think, therefore I am", we also each know of our existence because we sense and feel. "I feel, therefore I am" makes perfect sense if you don't demean senses. Who would you be if you had no sensations or feelings?

Our modern bias against the natural world manipulates and exploits most natural senses in order to create our artificial world. Sure, we applaud sight, smell, taste, touch and hearing. These senses help us change the natural world into artifacts and energy. They empower our culturally programmed domination of Nature. But thirst interferes with it. We don't control thirst, it controls us.

For sentient beings, the feelings of thirst is a smuch a part of water as is wetness. A sentient being's thirst feelings, help catalyze, regulate and balance its water relationships with Earth.

We seldom learn that the global life community manifests thirst feelings to help keep Earth's waters flowing for the community's survival as well as our own. Thirst is the water of the Planet expressing itself in us. Through its thirst feelings newborn infants know of water's existence before they ever drink it. The sensation not only tells us to drink the Planet's water, but quenched thirst feelings tell us when to stop drinking.

Thirst feelings are like all other natural feelings. They connect, regulate and balance.

Nature's many other senses complete the global sensation orchestra. For example, the sense of excretion beautifully counterpoints the sense of thirst. Excretion feelings signal that we contain excess water. They also tell us that the natural world needs us to excrete water. Our excretions are food for other beings just as the water we drink is an excretion of plant and animal respiration. That's Nature's balanced way, a wild perfection that shares everything, treasures everything and therefore produces no garbage.

Because modern bias demeans natural senses and feelings as subjective, unscientific, childish sentimentality, we seldom recognize their vital ecological role. Yet the Planet creates harmony through a balancing congress of senses like thirst, excretion, hunger, place, community, trust, joy, magnetism, rationality, nurturing, procreation, language, color...the more than 53 different sense groups that pervade the natural world and ourselves. Knowing the world through only a few senses is like seeing a rainbow in black and white. We lose much of its worth.

How much better the world would be today if through a strong integrated ecology our inforn survival senses of nurturing, community, trust, place joy and others thwarted our excessive industrialization and conquest of Nature within and without.

Integrated Ecology validates natural sensations because they make sense. They intelligently connect and balance for life's survival. When you feel a natural sense like thirst, you also feel the natural world nurturing itself in you and vice versa. Validating your natural feelings connects your modern awareness with Earth.

Modern society often detaches our over 50 inborn feelings and senses from the natural world. We let them die, or we re-attach them to destructive technologies and people. Modern people mostly live their lives in less than 12 natural senses. Our greatest problem, greed, is nothing more than some of our natural senses not being regulated by those senses we extinguished during our upbringing. History shows that we can't successfully live by our rationality and language senses alone, yet generally that's where we exist. Our runaway technology, pollution and violence are nonsense because we violate so many senses.

Integrated Ecology includes the Planet. By validating natural sensations, it enables our feelings to ground us in Earth's monumental stability and wisdom. Through it we discover that we don't exclusively own our feelings, they also belong to Earth. A common sense evolves that reverses beings and all beings. People with this common sense rarely produce the stress, pollution and violence that pervade modern life.

Because validation of natural feelings ecologically integrates them, World Peace University published my Field Guide to CONNECTING WITH NATURE: Creating Moments That Let Earth Teach. As an integrated ecology primer it offers hundreds of sensation stregnthening backyard or backcountry activities. They let us know Nature within and without by how good life feels. They enable Nature's balance to become our eyes.

ENVIRONMENTAL EDUCATION AT THE NATURAL HISTORY MUSEUM IN MEXICO CITY

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México

Abstract

Non formal environmental education programs. Workshop for elementary and junior high teachers on the understanding and application of simple environmental education activities have been sponsored by the Natural History Museum.

At the end of the workshop the teachers: Know about environmental education and be conscious of the need to change attitudes in our daily routine in order to improve our environment. Will develop, individually or in a group a program with environmental education activities integrated with their daily, weekly and monthly school activities.

This museum has had experience in school guided tours for more than ten years, and every week receives an average of 18 to 20 teachers with groups of 800 to 1000 students.

LA EDUCACION AMBIENTAL EN EL MUSEO DE HISTORIA NATURAL DE LA CIUDAD DE MEXICO. PROGRAMAS NO FORMALES.

Este es un curso de apoyo a los profesores de educación básica y media básica, para la comprensión y aplicación sencilla de actividades prácticas de educación ambiental.

Introduccion

La educación ambiental tiene un carácter eminentemente social y afecta la estructura política, económica y cultural de la comunidad, asimismo un carácter integrado que busca aplicar los conocimientos surgidos en varias disciplinas para el análisis del medio, de los recursos

naturales y de su problemática, promoviendo la relacion armónica del hombre y su entorno. El proceso de toma de conciencia individual en la educación ambiental, se ha concebido en tres niveles que permiten seleccionar y organizar las actividades mas adecuadas, en función a las características propias de la población a la que se dirigen.

I. Objetivos

Al finalizar el curso los profesores:

1. Conocerán que es la educación ambiental y serán conscientes de la necesidad de cambio de actitud en nuestra rutina cotidiana, para mejorar nuestro entorno.

2. Elaborarán individualmente o en grupo, un programa con actividades de educación ambiental integradas a su planeación escolar diaria, semanal y mensual.

II. Metodologia

En base al programa vigente en el ciclo básico escolar, del cual hay que partir y que tiene una gran riqueza temática se desprenden los ejes rectores que deberán desarrollarse en todos los grados de educación primaria. Esto se logra a través del "aprender haciendo" con estrategias de aprendizaje que propicien las actividades de los niños, para que sean estos los que descubran y construyan sus propios conocimientos a través del juego, la observación, la experimentación y la reflexión. En este sentido, la utilización de las posibles instituciones educativas como museos, bibliotecas, zoológicos, jardines botánicos, etc., deben contribuir a favorecer la vinculación del niño con su entorno. El maestro aprovechará de esto para que los alumnos valoren sus recursos, establezcan alternativas, compromisos y acciones de posibles soluciones a problemas locales que se puedan estudiar y trabajar en equipo. Los tres ejes rectores dentro de los que se debe realizar el trabajo son:

1. PERCEPCION EVALUACION DEL AMBIENTE

Este eje tiene como objetivo estimular al alumno en cuanto a su capacidad de percibir el ambiente, conocerlo y evaluarlo; integra actividades tendientes a desarrollar la curiosidad, la capacidad de observación, la búsqueda de relaciones que favorezcan la vinculación del alumno con su entorno.

2. MANEJO DE LOS RECURSOS NATURALES

Con esto se pretende contribuir al análisis de la problemática que presenta el manejo de los recursos naturales, a partir de la diversidad biótica y cultural del país, promoviendo una visión integral de los problemas.

3. CONTAMINACION AMBIENTAL

En este eje se articulan todas aquellas actividades cuyo objetivo es el análisis del deterioro ambiental causado por la contaminación, haciendo énfasis en opciones de solución al alcance del individuo.

A partir de estos tres ejes rectores, se recomienda que el maestro programe sus actividades de educación ambiental en relación al grado escolar en el que desempeña su trabajo y que lo desarrolle tomando en cuenta los 3 niveles de toma de conciencia:

1. sensibilización conocimiento
2. reflexión
3. concientización y compromiso

III. Actividades Sugeridas

Por grado, se analizará individualmente cada uno de los programas escolares. Después de una reflexión profunda y de una "puesta en común", se compartirán las ideas surgidas dando pauta al enriquecimiento, colaboración y creatividad de los propios participantes. De tal forma que cada uno de los profesores podrá elaborar su programa al grado escolar correspondiente, tomando en cuenta los tres ejes rectores para definir los temas. Los alumnos se motivarán para realizar las actividades a través de los 3 niveles de toma de conciencia. El profesor, dadas sus circunstancias y problemática, adecuará las actividades según las facilidades escolares, la edad, el entusiasmo, el interés y empeño de sus alumnos para realizarlas. A continuación se presenta un esquema de actividades generales para cada grado escolar.

CARING FOR THE EARTH: THE DEVELOPMENT OF AN ENVIRONMENTAL AND NATURAL RESOURCES CAREER WORKSHOP FOR GIRL SCOUTS

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Abstract

"Caring For The Earth" is a two week residential camp program for Girl Scouts cosponsored by nationally recognized Girl Scouts Wider Opportunities Program and the University of Wisconsin-Stevens Point College of Natural Resources. The Scouts explore career opportunities for women in the field of natural resources. Changes in attitude, knowledge, and skills will be discussed.

Introduction

A growing awareness of global environmental issues and of the limits to the availability of natural resources has resulted in widespread concern for the quality of the environment, and, in turn, the quality of human life. Associated with this concern is a recognized need for skilled professionals in the fields related to natural resource management and the protection of environmental quality. Societal concerns for cultural diversity, equity in the work force, and optimal use of human talent has also lead to interest in expanding the proportion of minorities and women in environmental and natural resource career fields. As discussed in the following paragraphs, several factors continue to prevent a greater proportion of women from entering these careers.

As stated in the Carnegie Annual Report (1989), "Deficient school science programs coupled with a general lack of encouragement contribute heavily to the underrepresentation of women, especially from minority groups and low income families, in science professions." Resource agencies across the nation including those in Wisconsin and Minnesota (Morrissey, 1989) have recognized the need to increase the proportion of women in the fields of natural resources and environmental quality. Currently, women hold 13.2% of permanent job positions in the Wisconsin Department of Natural Resources. Enrollment at the College of Natural Resources at the University of Wisconsin-Stevens Point has dropped from a high of approximately 20% in the early 1980s to a current level of 14% women. This parallels the enrollment trend in other university natural resource programs, particularly traditional forestry and wildlife programs.

Three national assessments of science in 1969, 1972, and 1978 by the National Assessment of Educational Progress indicated significant declines in girls', as oppose to boys', attitudes and beliefs towards science (NAEP, 1978).

In this decade, women will fill two-thirds of the new jobs created (Naisbitt and Aburdene, 1989). Given this trend as we enter the '90s, it is imperative that a greater effort and commitment be directed towards increasing the proportion of women in natural resource and other science related careers. Dr. Jane Kahle (1985), Purdue University, stated, "Only by fully understanding the situation of women in science today can all scientists work toward changing the status and role of women scientists tomorrow. Our vision must begin with today's science education where new approaches to teaching science stress its egalitarian image and provide equal educational opportunities as well." Kahle also reported that biology teachers who were successful in encouraging girls to stay in science used nontraditional role models, stressed creativity, provided science career information, avoided sex-stereotyped views of science, and included information on women scientists.

Dubois (cited in Oinonen,1984) also reports that the key to increasing the number of women who work in natural resources is to provide more career education for young women. By bringing more nontraditional role models into career education, students will think more imaginatively about career opportunities awaiting them. According to Grover (cited in Oinonen, 1984), schools in the United States fail to provide adequate vocational guidance and motivation for young people, especially women, as they face a rapidly changing social and economic society.

To increase the number of women who are interested in pursuing these career options, it is important that the strategies recommended by Kahle (1983) be used in educational approaches which are both formal and nonformal. One promising nonformal avenue is that represented by youth organizations such as the Girl Scouts, 4-H, and Girls Club of America.

The Girl Scouts of the U.S.A. appear to be an especially appropriate avenue for increasing career awareness because of the size of the membership, prior efforts in career education for girls, and their commitment to environmental awareness education (Dreier, 1988; Kennedy and Drier, 1989). The Girl Scouts of the U.S.A. (GSUSA), as a member of the World Association of Girl Guides and

Girl Scouts, reaches more than eight million members throughout the world (GSUSA, 1980). Career education efforts directed toward this population has the potential of influencing girls in 335 councils nationally, or on a global scale, girls throughout 112 countries. One program sponsored by the Girl Scouts with great potential in fostering career awareness is the Girl Scout National/International Wider Opportunities Program, through which girls are offered over 20 options yearly as they explore new experiences, learn about lifesyles, acquire new skills, make new friends and realize a fuller potential. For these reasons, the GSUSA Wider Opportunities Program represents a unique and untapped opportunity for recruiting young women to the field of natural resources and environmental quality.

Problem Statement

In summary, there is a recognized need to increase globally an awareness of environmental issues and of avenues to promote environmental quality. There is also a growing need for more professionals, especially women, in the field of natural resources and environmental management. As there is presently a lack of education programs addressing these needs, there is a demand for career education programs which would increase the awareness among women of these career opportunities. One promising avenue for reaching young women is through the Wider Opportunities program of the Girl Scouts of the U.S.A.

Objectives

Given the needs and opportunities discussed in the introduction, the overall goal of this study is the development of a model career education program for Girl Scouts which would assist young women in making informed decisions regarding careers in natural resources and environmental quality. More specifically the objectives of this study include:

1. To determine (a) the status of career development for women in the field of natural resources and environmental management, and (b) the relationships which exist between such areas as career development, women and minority issues, and environmental education/management.

2. To identify and evaluate existing educational efforts in this area that may be applicable to the development of the model career education program.

3. To develop and pilot test a model career program in natural resources and environmental management for use in a two week Girl Scouts Wider Opportunities Program called "Caring For The Earth" to be held at the Central Wisconsin Environmental Station.

4. To assess the impact of the pilot program on participants by determining changes in their knowledge, awareness, attitudes, skill development, social skills, motivation for participation in environmental action, and interest in pursueing careers in natural resources and environmental quality.

5. To recommend program revisions, based on an evaluation of the pilot program, and to recommend possible program adaptations for use in other Girl Scout Councils and youth organizations.

Findings

Due to the timeline for production of the Proceedings, the results of the pilot test held in June 1990 were not available at the time this article was submitted. The findings of the study, as well as related recommendations will, however, be presented during the conference. The impact of this program will be evaluated through the use of pre- and post-tests, attitude scales, questionnaires, journal writings, and other assessments (Kubiszn & Borich, 1987; Passineau, 1975).

Conclusion

"Caring For The Earth", a two week natural resources and environmental management career workshop, will incorporate environmental education goals aimed at developing knowledge, awareness, attitude and skills (Hungerford, et. al., 1980). The intent of this program is to further participant's environmental knowledge and awareness of related career opportunities, while increasing positive attitudes and self-confidence in this area.

The findings of the study will be reported in a thesis and research paper to share findings with all interested parties. These reports will also include recommendations on the implementation of similar programs which may benefit youth in related organizations.

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MUNICIPAL GOVERNMENT'S ROLE IN ENVIRONMENTAL EDUCATION

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Abstract

Municipal government can play a unique role in educating the general public about environmental issues, needs, and actions. This session will explore that role using experience and examples from the City of Fort Collins Natural Resources Division. We will discuss entity interaction, political aspects, media response, and public acceptance and demand.

Introduction

A major responsibility of the City of Fort Collins Natural Resources Division is to educate the public about natural resources protection. This is not a typical role for municipal government. Therefore, an in-depth look at such a program is warranted.

We should start by defining "education." Many people interpret "education" as classroom presentations or materials for the formal, K-12 education system. We define "education" more broadly. It encompasses providing all segments of the public, through formal and informal means, with information about the values of natural resources, threats to those resources, and actions that will protect natural resources.

Some people ask if education really results in natural resources protection. We feel the answer is a resounding yes. We also recognize an important role for enactment and enforcement of laws in any natural resources protection program. We caution that results of educational efforts will not appear overnight. Education and its results are a gradual process.

How, then, does municipal government conduct a natural resources education program? What financial resources are required? How will the public react? The experiences of the City of Fort Collins are helpful in answering these questions.

We employ a variety of educational activities while functioning within a stringent budget. Public response has been overwhelmingly positive. Comments such as, "This is the kind of thing I like for government to do for me," are typical of what we hear from the public. We also see positive reaction to education provided by local government, as opposed to state or federal government. Because of the strong tendency to consider natural resources protection someone else's responsibility, education provided at the local level helps individuals recognize their personal responsibilities. This is not to say that state or federal programs are not of value. When tailored to and implemented at the local level, such programs are effective and efficient, and they are a part of Fort Collins' overall program. The purpose of this paper is to discuss education activities that have been successful in Fort Collins.

Activities

Public Information Meetings And Programs

These are events to which individuals come to get natural resources information. Quite simply, they come to us, rather than us going to them.

Symposium--One of our most successful programs is an annual symposium. The format varies, but it basically is a weekday evening event for adult audiences, with a keynote speaker from the political, business, or education arena. After the keynote address, concurrent workshops on such topics as air quality, backyard wildlife habitat, hazardous waste, recycling, water and energy conservation, and other environmental issues are offered. Workshops are sometimes a typical slide show or lecture format and sometimes an informal, "walk-through" format resembling an environmental fair. Admission is free. Speakers provide their services free, and rental and other costs are kept to a minimum. When possible, advertising funds are solicited from the business community. Many brochures and hand-outs are provided, making printing a significant part of the budget for this event (using recycled paper, of course). Light refreshments are provided. The budget for this event is approximately $2,000. In addition to advertising, publicity includes press releases, word of mouth, mailing to the division's mailing list (approximately 800), announcements in newsletters, and flyers posted at various locations.

Workshop series--The City's Light and Power Utility and the Natural Resources Division jointly sponsor an annual series of six to nine monthly workshops titled ENERGY AND NATURAL RESOURCES. One important aspect of this series is that, being a cooperative effort, it helps achieve our goal of involving other City departments in natural resources education, promotion, and ownership (an aspect of internal education). Workshop topics include making energy choices when buying, selling, or building a home; improved lighting at lower cost; global warming, wildlife, and other environmental topics. The two-hour workshops for adult audiences are held on weekday evenings. Light refreshments are provided and a door prize is given away. Admission is free. Budget for each session is approximately $250. Publicity is similar to that for the symposium.

Children's Programs--The Public Library operates a seven-week activity program for children during the summer. The Natural Resources division participates in this program with environmental story hours, nature walks, slide shows, and other learning activities. The program is free.

Speakers Bureau

In this category, instead of people coming to an event we schedule, we go to events scheduled by others.

Organizations--Service organizations, newcomers clubs, senior citizens groups, parent organizations, and others call us seeking speakers on various environmental topics. These range from breakfast or lunch meetings with a strict time limit on presentations, to more relaxed afternoon or evening meetings with a flexible presentation schedule. Slides, videos, or other visual aids are usually used in these presentations.

Classrooms--We are listed with the school district speakers bureau. Teachers of all grades call on us for presentations on various environmental topics. Slides, videos, games, and other formats are used depending on the age level involved.

Displays

This category includes educational displays at locations where people go for other purposes and are exposed to natural resources education as a "bonus."

Shopping Malls--We set up displays at shopping malls during Public Works Week, Earth Week, and other featured events. Such displays are designed to be eye-catching and communicate a simple, direct message. They are usually designed for adults, but elements attractive to children are sometimes incorporated. Displays are inexpensive, done either on foam core or on a purchased hook-and-loop display board. Hand-outs are an important part of these displays, since people spend only a few minutes at the display itself. Sometimes short (two to five-minute) videos are run as an additional attention-getter. A weekend display will generate a few hundred contacts at a small mall to a few thousand at a larger mall. A staff person is at the display whenever possible.

Library--The Public Library has a "Conservation Center" in the adult section. The center includes handouts and brochures on natural resources protection topics and a different display each quarter featuring some aspect of natural resources protection. Three departments, Water and Wastewater, Light and Power, and Natural Resources, share responsibility for developing and maintaining the displays. Again, the involvement of other City departments is a key factor in building awareness of environmental issues.

Publications

Newsletter--The Natural Resources Division publishes a quarterly newsletter on local natural resources projects, special activities, and natural resources protection information. The newsletter is mailed to approximately 800 people and distributed to an additional 200 at pick-up locations, with a planned increase of pick-up locations as budget allows. The current newsletter budget is $2400. The newsletter is distributed to the public free.

Brochures--We write brochures on topics such as xeriscaping, woodburning, composting, grass clipping advice, and recycling. Brochures are supplied free to the public and are distributed in various ways including newspaper inserts, pick-up locations, and at events. The public demands that these be printed on recycled paper. That public demand justifies the higher cost of using recycled paper. We also distribute appropriate brochures written by other agencies, e.g., global warming brochures by the Union of Concerned Scientists and air quality brochures by the American Lung Association. Even if we have to purchase the brochures, we provide them to the public free. Care is taken to distribute only scientific, factual brochures. We do not distribute fund raising, membership building, or other brochures that may be deemed inappropriate for government distribution.

Utility Bill Insert--"City News," an insert in the City utility bill each month, is written by the City Manager's office. The Natural Resources Division tries to have environmental protection information included in the insert at least two or three times each year.

Conclusion

One common thread runs through our programs -- they are free. We consider this a major key in the success of our programs.

Our community is highly environmentally aware and seems to be using that awareness to develop environmentally sensitive lifestyles. We would never attempt to take sole credit for this awareness, but it does appear that local government's role in providing natural resources education has been significant.

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ANIMAL EMBASSADORS

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Abstract

The Ambassador Program matches corporate sponsers with low-income schools. Each corporate sponsorship provides indepth classroom activities, two zoo field trips, and followup community-based activities to help students investigate animal adaptation, ecology, and conservation.

As budgets continue to tighten, schools search for creative ways to fund educational experiences. At the same time, industry searches for ways to improve the work force by supporting quality educational experiences for youth. Responding to these needs, the Zoological Society of Milwaukee County, through its Associate Board, has initiated the Ambassador Program to pair corporate sponsors with low-income schools. The Associate Board consists of 31 volunteers from the business community who serve as fund raisers and public relations consultants for the Zoological Society. They personally contact and secure the corporate sponsors.

Each sponsor acts as an ambassador from the business community to provide an extensive five-part educational opportunity. The sponsor funds admission, parking, and bus transportation for two zoo visits as well as the cost of materials for two classes of its school partner. The overall goal of the program is three-fold. First, it makes the students aware of how their behavior affects the world around them. Second, it shows them how to change their behavior to minimize the negative impact they have on the environment. Third, it encourges them to share what they have learned with others.

The Ambassador Program begins when a Zoological Society Education Coordinator visits schools to introduce the program to students who will be involved. Dressed as *Noah and pulling a little ark on wheels, the coordinator* explains the program's goals and timetable and compares the modern zoo to Noah's ark. After the presentation, he pulls official Animal Ambassador t-shirts out of the ark and gives them to students. Each shirt has the Animal Ambassador logo on the front and the corporate sponsor's logo on the back.

The second component of the program is entitled, "Let's Eat and Run". It features four adaptation activities that teachers do with students in the classroom, and a field trip to the Milwaukee County Zoo. At the zoo, Zoological Society staff or volunteers give thirty minute hands-on orientation presentations followed by ninety minute guided tours of the zoo. They utilize the exhibits to illustrate adaptation. The classroom activities, orientation presentation, and guided tour focus on feeding and movement adaptations.

The third component of the program is entitled, "It's a Small World". Once the students have learned about animal adaptation, they can learn how the animals use those adaptations to interrelate with each other and their environment. They also learn how their own behavior affects those relationships. Like the second component, it includes four classroom activities and a zoo field trip with an orientation and a guided tour.

The fourth component is a class project that teachers and students design themselves. They are free to use any vehicle they wish to teach the rest of the students in their school the things they have learned. They also share the project with their corporate sponsor. Project vehicles chosen have included science fairs, murals, skits, banners, and classroom activities.

The final component of the program is the "Animal Ambassador Family Fun Packet". Students receive packets that encourage them to be "Animal Ambassadors" to their families, neighbors, and friends. The packets include activities students can do at home to help the animals, four free zoo admission and public transit passes, activities the students can use at the zoo to teach their families and friends how to be Animal Ambassadors, and "official" Animal Ambassador I.D. cards.

The program is evaluated by the participating teachers and parents or guardians of the students. Teachers complete a written questionnaire to evaluate the first four components of the program under the following criteria:

Content
Age Appropriateness
Student Involvement
Ease of Use

Parents or guardians of the students complete short evaluation cards to turn in on their zoo visit during the fifth component of the program. They are asked if their children shared the program information, if they used the Fun Packet activities, and how they feel about the program. When they turn in their card, they receive a small gift. At the completion of the program, the parent evaluation cards are used in a random drawing. The school represented by the winning card receives a VCR or similar piece of audio-visual equipment.

Good corporate citizens realize that they can no longer remain idle and place the entire responsibility for educating our youth on the schools. Through its Animal Ambassador Progam, the Zoological Society of Milwaukee County is giving them the opportunity to invest in their own futures by investing in the youth of the community.

THE AMERICAN CAVE AND KARST CENTER

David G. Foster
American Cave Conservation Association
Horse Cave, Kentucky

20 percent of the United States is underlain by geologic formations known as karst, a terrain characterized by caves, sinkholes, and rapid underground drainage. Uniformed land use planners, engineers, builders, and individuals frequently make costly environmental mistakes in this terrain. Understanding how groundwater works will be a preeminent need in the 1990s. Caves provide one of the few natural windows into the groundwater environment.

ROLE OF ENVIRONMENTAL EDUCATION IN THE PROCESS OF NATURAL RESOURCES CONSERVATION IN THE ECOLOGICAL RESERVE "EL TRIUNFO", CHIAPAS, MEXICO

Martha Gabriela Torres Gomez
Universidad Nacional de Heredia PRMVS
Heredia, Costa Rica, C.A.

The Environmental Education program, in two local rural villages near the Ecological Reserve, confronts a change in its perspective of works. Recognition of all critical social groups that have an influence on decisions about the use of resources and of those factors that, in some way or another establish a pattern of Man-Nature relation, is needed. (An example of this is the project carried out by the staff of The Natural History Institution, of Chiapas, Mexico).

THE WORLD WE SHARE: USING THE NEWSPAPER AS A TOOL FOR ENVIRONMENTAL LITERACY

Rebecca Belue Haynes
The Commercial Appeal
Memphis, Tennessee

Newspaper In Education (NIE) programs strive to help students master basic skills while developing an awareness and understanding of our world. This session will present an overview of NIE programs and players, demonstrate implementation of newspaper-based EE instruction in the regular classroom, review NIE curriculum for EE and discuss ways NIE and EE can work together to build environmental literacy.

ENVIRONMENTAL ETHICS AND NATURE PHOTOGRAPHY: A METAPHOR FOR HUMAN INTERACTION WITH THE ENVIRONMENT

Cub Kahn
New Market, Virginia

Abstract

Environmental ethics can be introduced as an integral part of nature photo instruction in formal and non-formal educational programs. This paper explores codes of ethics for nature photographers, case studies of the environmental impact of nature photographers and hypothetical ethical dilemmas appropriate for classroom use.

"When a photographer alters the behavior of an animal it is harassment...The problems (nature photographers) have the potential to cause may not show up until long after we are gone." (Foott 198)

"...I have found it a good idea to drive through areas that have good deer populations and place hidden baits of corn in a number of locations...To sum it all up, I do whatever the situation requires to get my deer photographs." (Rue, 1990)

Nature photography by definition involves interaction between the photographer and the environment. Intentionally or unintentionally, a nature photographer's behavior in the field is a manifestation of that person's values and attitudes toward nature. In the practice of nature photography, whether as a hobby or as a profession, photographers "act out" their environmental ethics.

Though the environmental impacts of a single nature photographer are usually small, the collective effects of photographers in heavily used national parks, national wildlife refuges and other public lands can be significant. For example, consider the cumulative effect of hundreds of park visitors photographing (and, all too frequently, feeding) the same herd of deer in a single summer. More importantly, the environmental ethic that an individual exhibits--and develops--as a nature photographer is the same environmental ethic that plays a role in mediating all the other decisions and actions in one's everyday life.

Nature photography is a hobby for millions of Americans. One of the measurers of the popularity of this activity is the large number of outdoor photo workshops offered throughout the United States as well as abroad. The Guide to Photography Workshops (1989) lists 150 companies, organizations and schools offering outdoor, nature and travel photo workshops during 1990, far more than in any other subject area of photography.

Nature photo instruction in both formal and nonformal settings--elementary and secondary education, continuing education, nature center programs, private workshops and tours, community college courses, and programs sponsored by conservation organizations--offers a prime opportunity to educate a wide range of audiences, from preschoolers to senior citizens, about environmental ethics. This can be done through a combination of classroom discussion, presentation of case studies of the environmental impacts of photographers, consideration of potential ethical dilemmas confronting nature photographers, and actual field photography sessions.

Codes of Ethics

Possibly the most widely circulated code of ethics for nature photographers in the United States is "The Nature Photographer's Code of Practice" published by the Nature Division of the Photographic Society of America. This code provides specific guidelines for photographers dealing with various subjects including birds, insects, plants, tidepool fauna, amphibians, reptiles, caves and pictographs. It also gives general guidelines such as: "Killing or injuring any living thing is not a proper part of nature photography."

An excellent code of ethics for teaching purposes has been developed by Denver's Urban Wildlife Photo Club under the direction of professional nature photographers Wendy Shattil and bob Rozinski. The code of "Urban Wildlife Photo Ethics" emphasizes preparation on the part of the photographer before going into the field. For example, "Learn as much as you can about the species, habitat and family groups of the animals you wish to observe and photograph."

Similar codes of ethics have been produced by numerous camera clubs and other wildlife-related organizations. Though each is unique, subjects generally covered in such codes include the following:

1. The photographer's regard for other photographers encountered in the field.
2. The photographer's regard for private property rights.
3. The photographer's respect for regulations governing the use of public lands and resources.
4. The need to minimize disruption of flora and fauna when photographing.

5. The importance of not harassing animals.
6. The photographer's knowledge of the behavior, life history and survival needs of the species being photographed.
7. The particular importance of not interfering with nesting, other reproductive behaviors, and extremely young animals.
8. The significance of protecting rare and endangered species.
9. An acknowledgement of the collective as well as the individual impacts of photographers on nature.
10. The need to share one's conservation ethic with others through exemplary behavior and through photographers policing their own ranks.

Rather than simply reviewing existing ethical codes, discussion of photo ethics is better accomplished by creating a group code of ethics as part of a class or workshop in nature photography. This can be done by each individual, in small groups or as one collective activity of the whole class.

Reaching consensus on some points may be difficult or even impossible--for example, "Is any harassment of wildlife permissible?" However, an open forum on such points is educational for all concerned and will usually produce lively debate. As with any study of ethics, the instructor must facilitate open discussion, in part by showing and encouraging respect for each individual's ideas and values.

Case Studies

The reality of nature photographers having detrimental impacts on the environment can be easily illustrated through case studies of human-wildlife conflicts, particularly by presentation of highly visible problems on public lands. This can be done in the classroom with slides or video of such conflicts.

Examples of case studies that I have used in photo ethics programs include (a) visitors feeding and photographing roadside macrofauna in national parks (for instance, white-tailed deer in Shenandoah National Park); (b) photographers competing with one another to get closest to large mammals (for example, elk and mule deer) on public lands in the West; and (c) photographers interfering with the daily movement and feeding patterns of wildlife (for instance, the bighorn sheep at Sheep Lakes/Horseshoe Park in Rocky Mountain National Park). Other case studies are easy to find by observation of photographers on public lands, especially in heavily used national parks, or by reading magazines such as Outdoor Photographer and Outdoor & Travel Photography.

Hypothetical Ethical Dilemmas

Wrestling with hypothetical ethical dilemmas that confront nature photographers is the most enjoyable and challenging part of the classroom study of photo ethics. Frequently it provides an eye-opening learning experience for students who must identify and assess their own values and compare them to the ethics expressed by others.

One approach is for the instructor to present a hypothetical dilemma with a number of possible solutions, give each student a few moments to think it over, and then discuss the ethical and environmental ramifications of each alternative.

For example: You are walking in a forest and come across a nest with one baby bird in it. You begin to photograph the nest at close range and the nestling becomes excited and falls out of the nest. What do you do?

(a) Immediately leave the area.
(b) Continue to photograph the bird on the ground.
(c) Place the bird back in the next and continue to photograph it.
(d) Place the bird back in the nest and leave the area.
(e) Take the bird home to care for it.
(f) Take the bird to a wildlife rehabilitation center.

Surprisingly, a problem such as this can, if time allows, spur literally hours of spirited debate. Students will inevitably come up with other alternatives. Students, even in the K-3 age group, will also nearly always raise additional questions: What kind of a bird is it? (Many students say they might treat a starling and a robin differently.) How old is the bird? Are the baby bird's parents nearby? Is the nest in a remote area? Does the bird appear to be injured after its fall? These questions offer a valuable opportunity to expand the scope of a photo ethics discussion into biology and ecology.

Field Sessions

Classroom discussion of photo ethics is ideally followed by photo field sessions that allow participants to actively apply their own values firsthand in their contact with nature. In the field, nature photography students who have been sensitized to ethical issues seem to show a heightened sense of observation and awareness of their personal and collective environmental impacts. Though research is lacking in this area, it is hoped that this heightened concern for the well-being of nature can spill over into other areas of the students' lives.

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FAMILY SCIENCE PROGRAMS IN AN INFORMAL SETTING

Laura J. Lehtonen
Armand Bayou Nature Center
Houston, Texas

Parent/child nature or science classes are effective in encouraging parental support for science, increasing environmental awareness and involving minorities in science activities. This session will present practical approaches for designing and teaching these classes with an emphasis on programs for Hispanic parents and children.

PROGRAMA DE INTERPRETACION AMBIENTAL PARA EL AREA DE CONSERVACION ECOLOGICA DE LA CIUDAD DE MEXICO

Sofía Urbina Loyola[1]
México

Abstract

Mexico City's government, through COCODER-DDF., implements an Environmental Interpretation Program for its Ecological Preservation Area as a service for visitors of this area which counts on natural systems of great attractiveness, among other matters, in order to develop non-formal Environmental Education Activities. This program hopes to promote a change of behavior among this great city's inhabitants and to improve the handling of its natural resources and environment.

I Introduccion

La Ciudad de México forma parte de la zona metropolitana mas grande del mundo. Cuenta actualmente con una población de cerca de 12 millones de habitantes y una superficie de 150,000 Has., sin embargo, la parte urbana de esta entidad ocupa solamente un poco mas del 40% de su superficie total, ya que el 60% restante, constituye un territorio con características y con recursos agroforestales, que hasta hace poco tiempo no era tomado en cuenta.

Esta zona rural del Distrito Federal, hoy denominada Area de Conservación Ecológica, cumple con funciones de gran importancia a nivel regional, ya que sus sistemas naturales permiten, entre otras cosas:

- Captación, infiltración y purificación del agua.

- Generación de oxígeno.

- Conservación de la vida silvestre.

- Recreación al aire libre.

- Investigación científica.

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Además, el Area de Conservación Ecológica del Distrito Federal cuenta con recursos naturales que ofrecen un gran atractivo y pueden ser aprovechados en el desarrollo de programas para visitantes en los que se consideren actividades de educación ambiental.

Una herramienta muy importante para este tipo de educación, la constituyen los Programas de Interpretación Ambiental, considerados como un servicio a los visitantes de parques, reservas, refugios y otras áreas naturales protegidas. Aunque la concepción del término varía en las diferentes regiones en donde se ha adoptado, se puede considerar a la Interpretación Ambiental como una actividad recreativa cuya finalidad es educar utilizando elementos originales de un lugar y ayudar así al visitante a entender de una manera sencilla las diferentes interrrelaciones y complejidades del ambiente. De esta forma, un Programa de Interpretación Ambiental, es un conjunto de servicios en términos de educación, información, entretenimiento e inspiración, que guía al público para hacer de su visita a un área natural, una experiencia mas provechosa y agradable.

Los resultados obtenidos en lugares donde se han desarrollado estos programas, han demostrado que la interpretación tiende a incrementar en el visitante su interés por la naturaleza, estimulándolo a participar en acciones de conservación de los recursos naturales.

Un Programa de Interpretación Ambiental cuidadosamente fundamentado y ejecutado, es una herramienta y un complemento de las metas y objetivos que se plantean en los programas de manejo y conservación en áreas naturales protegidas. Algunos de los beneficios que puede generar, son los siguientes:

- Contribuye directamente a enriquecer las experiencias del visitante.

- Hace que el visitante se compenetre mas objetivamente con el medio natural a través del conocimiento de su complejidad y de su íntima coexistencia con él.

- Informa a los usuarios, creando un conocimiento público que puede favorecer las decisiones relacionadas con el manejo de los recursos naturales.

- Reduce la destrucción de los recursos del área, así como la introducción de elementos ajenos.

- Promueve un atractivo para el público y lo motiva a tomar acciones para proteger el ambiente y salvaguardar áreas similares que pueden decaer ante el impacto humano.

II Objectivo

Informar, educar y sensibilizar a los visitantes de las áreas naturales protegidas del Area de Conservación Ecológica del Distrito Federal, sobre los beneficios derivados del uso racional de los recursos naturales, a través del desarrollo de actividades culturales y recreativas.

III Ubicacion y elementos del programa

Para cubrir el objetivo propuesto, es necesario elegir y adecuar sitios propicios para desarrollar las actividades del Programa. Los sitios propuestos deben ubicarse de tal manera, que permitan aprovechar lo mejor posible los elementos disponibles en el área elegida.

Es importante recordar que deberán existir zonas con acceso permanentemente restringido al público para recuperar, proteger y conservar los recursos naturales contenidos.

El Programa de Interpretación Ambiental aquí propuesto, incluye elementos básicos y una serie de actividades guiadas a desarrollar en los propios elementos del programa durante las temporadas de alta afluencia de visitantes.

Los elementos del Programa se planean buscando aprovechar por un lado, la infraestructura y los espacios que se presentan actualmente en las áreas protegidas del Distrito Federal y por otro, componentes tradicionales de procesos interpretativos ya probados en programas implementados en parques y reservas.

Los elementos propuestos para el Programa de Interpretación Ambiental del Area de Conservación Ecológica del Distrito Federal son los siguientes:

1. Senderos de la Naturaleza.

2. Miradores para la Interpretación del Paisaje.

3. Jardines Botánicos Silvestres.

4. Estaciones Faunísticas.

5. Centros de Visitantes

6. Estaciones Biológicas.

7. Areas Recreativas.

8. Módulos de Registro e Información.

9. Areas de Convivencia Infantil.

10. Areas campestres.

Una de las metas del Programa de Interpretación es distribuir a los visitantes en diferentes áreas de interés, para evitar aglomeraciones en los puntos tradicionalmente visitados. Asimismo, deberá ofrecer una variedad de actividades que permitan a los visitantes integrarse a aquellas que satisfagan sus necesidades particulares de distracción y recreación.

A continuación se explica brevemente en que consiste y donde puede ubicarse cada elemento del Programa.

1. Senderos de la Naturaleza.

Caminos naturales ya trazados en donde se desarrollan temas especializados en flora y fauna silvestre, geología, ecología, etc. También se utilizan para realizar actividades recreativas y artísticas.

2. Miradores para la Interpretación del Paisaje.

Se ubican en sitios donde la belleza escénica se puede apreciar sin obstáculos. Además, se colocan paneles con información acerca de lo que se esta observando.

3. Jardines Botánicos Silvestres.

Areas con una riqueza floristica importante, en donde se proporciona a los visitantes información en placas fijas sobre comunidades vegetales, ciclos biológicos, usos de las plantas, nombres comunes y científicos.

4. Estaciones Faunísticas.

Areas muy protegidas que sirven como centros de estudios y reproducción de especies animales naturales del área, que cuenten con poblaciones pequeñas o en peligro de extinción.

5. Centros de visitantes.

Aprovechando construcciones existentes, en estos sitios se montan exposiciones con temas alusivos a los diferentes elementos con que cuenta un área y se ofrecen pláticas, audiovisuales y películas. También pueden utilizarse como sede administrativa de un área.

6. Estaciones Biológicas.

También utilizando construcciones ya existentes, estos elementos son el sitio donde se realizan monitoreos permanentes acerca de los procesos ecológicos que ocurren en un área, con el objeto de mantenerla en buen estado.

7. Areas Recreativas.

Sitios en donde se colocan juegos rústicos infantiles, mesas, asadores y paneles informativos sobre acondicionamiento físico.

8. Módulos de Registro e Información.

Instalados en los accesos o sitios de concentración de las áreas, cuentan con personal especializado y material impreso que proporciona a los visitantes información sobre las actividades que puede realizar.

9. Areas de Convivencia Infantil.

Sitios que deben contar con juegos infantiles rústicos, zonas para actividades artísticas y pequeños encierros de animales como mapaches, conejos y venados.

10. Areas Campestres.

Se ubican a lo largo de carreteras o vías principales, contando con la infraestructura adecuada para realizar comidas campestres.

IV Advances

Dentro de este programa global de Interpretación Ambiental, el Gobierno de la Ciudad de México ha puesto ya en funcionamiento cuatro senderos interpretativos y dos miradores en dos diferentes áreas protegidas.

Actualmente se realizan seguimientos permanentes sobre su funcionamiento y se continúa trabajando para implementar el resto de los elementos del Programa, ya que se considera un medio adecuado para desarrollar la Educación Ambiental entre los habitantes de la Ciudad de México.

"ENVIRONMENTAL EDUCATION PROGRAM AT CHILPANCINGO ZOO, MEXICO"

M.V.Z. José A. Bobadilla Lugo
BIOL. Olivia Sparza Guadarrama
Mexico, D.F., Mexico

Abstract

Some of our experiences in non-formal environmental education programs at the Chilpancingo Guerrero Zoo in Mexico will be described. The creation of the environmental education department, at Chilpancingo Zoo, in to the statal program PRONASOL. This department will be, the center of divulgation and information. Like the best way to bring knowledge, to make conservation and good use of the natural resources at Guerrero State.

Introduccion

El programa de Educación Ambiental en el Zoológico Regional de Chilpancingo, Guerrero, persigue por medio de la participación de sus visitantes y de la comunidad en general, la identificación de la estrecha relación que existe entre el hombre y su entorno natural.

El Zoochilpan es un centro estrátegico de recreación de la población tanto urbana como rural cercana a la ciudad de Chilpancingo, es el sitio idóneo para llevar a cabo actividades de educación que permitan una mayor sensibilización de la comunidad en general a los problemas y procesos ecológicos actuales y futuros.

Los Zoológicos como espacios físicos juegan un papel muy importante para la conservacion y reproducción de especies raras, amenazadas o en peligro de extinción, sin embargo, actualmente están siendo utilizados como centros de educación participativa y de investigación, no solo en lo que a fauna silvestre se refiere, sino también para el mantenimiento de las relaciones que se establecen entre las plantas y los animales.

Es claro que el proceso económico y social de un estado debe fundamentarse en una estrategia de desarrollo que maneje adecuadamente los sistemas naturales para asegurar su perseverancia, así como la conservación de los ciclos establecidos a largo plazo.

En la mayoria de los casos el manejo eficaz de estos sistemas y sus ciclos, depende del apoyo y la cooperación de un público bien informado, motivado, activo pero principalmente bien educado.

Con base en lo anterior, el objetivo de esta propuesta es introducir en el Zoológico Regional de Chilpancingo, Guerrero un programa contínuo de Educación Ambiental y de definición de conocimientos en relación con los sistemas naturales y sus componentes a través de actividades teórico prácticas, utilizando las instalaciones del Zoochilpan como centro de actividades.

Objectivos Especificos

Despertar el interés de los niños en temas relacionados con el conocimiento de la flora y la fauna así como su relación con el entorno urbano o rural.

Reorientar los conocimientos que sobre las ciencias naturales los niños poseen, con el fin de involucrarlos en actividades individuales y colectivas para la conservación de su entorno.

Reforzar en los niños el conocimiento de los ecosistemas naturales por medio de actividades recreativas no formales de modo que se complemente el conocimiento teórico con el práctico.

Despertar el interés por la naturaleza en grupos de adultos (padres de familia o público en general) identificando los impactos negativos del hombre en el medio.

Hacer del conocimiento general las medidas domésticas para mitigar los impactos causados por el hombre a los sistemas naturales desde el hogar.

Hacer conciencia en la población adulta de las transformaciones causadas en el ambiente por el desarrollo socio-económico e industrial de las comunidades humanas.

Conformar grupos de voluntarios que funcionen como guías y ayudantes dentro de los recorridos del parque zoológico.

Realizar cursos o actividades especiales para profesores de primaria y educación media, para reforzar los conocimientos y la forma de comunicación de las ciencias naturales en las aulas de educación formal.

Promover convenios para la investigación científica en universidades e institutos, relacionados a los problemas ambientales y ecológicos locales, con el objeto de apoyar con datos y ejemplos cercanos, las actividades de difusion de las ciencias naturales en el Zoochilpan.

Promover reuniones con los diferentes sectores de la sociedad local, sobre los problemas, causas y efectos de la degradación ambiental (cacería, deforestación, uso del agua, manejo de la basura) que la misma comunidad pueda instrumentar y llevar a cabo.

Metas

Las metas que a continuación se señalan han sido parcialmente logradas; en otras sin embargo no han sido instrumentados los mecanismos para lograrlas.

En relación directa con el programa de educación ambiental las metas propuestas son:

a) Realizar dos cursos anuales en periodos vacacionales para niños de diferentes edades.

b) Proyectar audiovisuales y películas para público en general por lo menos 2 veces al mes y desarrollar reuniones de temas específicos.

c) Realizar visitas guiadas en forma continua para grupos escolares organizados y especializados para profesores.

d) Realizar visitas guiadas para público en general los fines de semana.

e) Colocar un periódico mural mensual en las vías de acceso, restaurant y tiendas dentro del Zoológico.

f) Instrumentación de una guia para visitantes al Zoológico y el establecimiento de un sendero interpretativo.

g) Concluir la señalización interpretativa e informativa dentro del Zoológico.

Ahora bien, el logro de las metas siguientes coadyuvará a la mejor operación y obtención de resultados del programa de educación:

h) Modificar y readecuar los encierros conforme a los requerimentos de cada especie, lo mas cercano posible a las condiciones naturales.

i) Concluir la imagen del Zoológico (Logotipo).

j) Formular alternativas de obtención de recursos económicos a través de la comercialización de camisetas, afiches, etc., con motivos del Zoológico.

k) Equipar vitrinas para exhibición de elementos propios del Zoológico (huevos, esqueletos, plumas, etc.)

Financiamiento

En este sentido el programa de Educación Ambiental estaría financiado básicamente por los recursos generados por el propio parque y en segundo término por los ingresos obtenidos gracias a las actividades propias del programa de Educación Ambiental las cuales serían autofinanciables (cursos de verano, venta de afiches, etc.).

Lo anterior no excluye la posibilidad de crear un programa de apoyo de la sociedad local, a través de donaciones, vía suscripción a boletines, o como patrocinadores. Esto incluye también la adopción simbólica de animales dentro del Zoológico tal y como se realiza en otros parques del mundo.

Advances

Durante 1987 y 1988 se iniciaron las actividades relacionadas con la proyeccion de audiovisuales.

Las primeras readecuaciones de los encierros y su ambientación. Se iniciaron los trabajos encaminados a lograr la transformación del Zoológico en un centro de fauna regional (sin que con esto se haya pretendido eliminar por completo la fauna exótica).

En el verano de 1988, se realizó el primer curso de verano, con la participación de niños de 7 a 10 años, elaborándose fichas didácticas.

En 1989 se inició la publicación del periódico mensual "EL ZOOL" responsabilidad directa de la Dirección del Zoológico. Este está siendo sujeto de modificaciones a fin de convertirlo en un instrumento de difusión para todo tipo de visitantes.

Se diseñaron fichas técnicas en las que se consideran no solo cuestiones relacionadas con la fauna sino también con el resto de los componentes de los sistemas naturales.

Se está terminando el guión de un audiovisual informativo para padres, en el que se reseñan los objetivos de los programas de Educación Ambiental y el papel de los Zoológicos en el desarrollo de los mismos.

Datos recientes indican que el movimiento de visitantes al Zoochilpan fluctúa alrededor de 19 mil personas al año entre niños y adultos. Sin embargo, debido a la falta de sitios adecuados para la recreación en Chilpancingo, el Zoológico puede llegar a ser uno de los principales lugares de reunión y recreo para la población local.

Aunque para muchos la importancia de un parque Zoológico está directamente relacionada con su extención y con las especies que en él se encuentran, consideramos sin embargo que dadas las caracteríticas y condiciones socio-económicas de los países en vías de desarrollo, cualquier Zoológico por pequeño que sea, debe convertirse en un centro de educación participativa, dando la importancia que merece cualquier especie animal o vegetal por pequeña o común que esta sea. Nos es importante señalar también que el éxito de un programa de estas características se debe sustentar con la participación y conformación de un equipo de trabajo multidiciplinario y activo.

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ATMOSPHERIC MEASUREMENTS AND STANDARDS TO PROVIDE EXPERIMENTAL SUPPORT FOR AIR QUALITY STUDIES

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Abstract

Mexican experts working in atmospheric pollution have been facing the lack of reliable data originated either from the meteorological and/or air pollution monitoring networks. Laws and regulations for environmental control are not supported in Cities, like Mexico, in a rapid process of industrialization, by experimental studies because there are not at present research institutes and universities dedicated to verify and to recommend methods and experimental schemes, for the proper application of monitoring and measurements of meteorological and air pollution parameters and also to create training courses in environmental sciences.

MEDIDAS Y ESTANDARES ATMOSFERICOS PARA PROVEER SOPORTE TECNICO AL ESTUDIO DE LA CALIDAD DEL AIRE

Antecedentes

La idea de trabajar con estándares en meteorología no es algo nuevo, hace tiempo que se ha ido incrementando la necesidad de contar con estándares meteorológicos ya sea para valores o medidas de variables meteorológicas matemáticos de pronóstico o control, definición de términos, y en la instrumentación. Por ejemplo ya en 1959, Poncelot, sugirió el uso de equipo estandar para pruebas en los colectores de lluvia; en 1960 Pharo y Lamb propusieron pruebas estándares para la instrumentación meteorológica en general; de la misma manera lo han hecho otros investigadores en nuestro país H. Bravo (1976), A.Baez (1975) y E. Levy (1982).

Es un hecho, el que cada usuario del término "estandar" tiene su propia idea de lo que esto significa, el problema tiene diferentes puntos de vista por los diversos grupos de usuarios. De hecho los Estandars Meteorológicos involucran una amplia variedad de: criterios, guías, valores y fenómenos físicos. Los estándares de mayor interés son las de instrumentación y cantidades meteorológicas, los de métodos de medida, los de manejo y análisis de datos, finalmente establecer y mantener la actitud ética y profesional de la actividad de los meteorólogos.

Origen De La Necesidad

Las actividades sociales y políticas de los diversos grupos que buscan proteger el medio ambiente en el cual vivimos, han estimulado la necesidad de los estándares meteorológicos, a través de la promulgación de leyes que limitan y controlan la emisión de contaminantes. Lo que ha conducido al establecimiento de estándares ambientales regulatorios.

Tales estándares gobiernan la extensión de cualquiera de las actividades humanas que pueden alterar la composición y estructura física de la atmósfera. Inevitablemente las reglas asociadas con tales estándares requieren que ciertas medidas especificas se hagan de acuerdo a métodos estandarizados predeterminados. Pero si no se cuenta con tal metodología estandar, es necesario inventar o diseñar métodos propios, aunque tales métodos de medida serán solo tan buenos como son sus fundamentos científicos y técnicos que los soportan. Este ha sido un gran problema para los países en desarrollo, especialmente para México, y otros de Centro América y Sur América.

Así los requerimientos para establecer proposiciones de impacto ambiental y las redes del monitoreo ambiental han involucrado la participación de un gran número de técnicos y profesionales no especializados en las medidas atmosféricas. Los que urgentemente requirieron de: métodos de análisis que representaban la mejor tecnología disponible, la instrumentación de relativa calidad conocida que debería ser utilizada por ese personal y métodos de medida de cierta exactitud preestablecida, que mantenía un grado de conformidad con algún valor estandar reconocido, publicado por una institución de prestigio como la WMO (World Meteorological Organization), la AMS (American Meteorological Soc.), la EPA Environmental Pollution ASS.), la APCA (Air Pollution Control Ass.), entre otras.

En México, de las instituciones que se dedican a trabajar con medidas e instrumentación de la atmósfera como el Servicio Meteorológico Nacional, la SEDUE, el Centro de Ciencias de la Atmósfera de la UNAM, e incluso la, ninguna está dedicada a proporcionar métodos estándares de medida e intrumentación y mucho menos a producir documentos que describan los métodos y procedimientos estándares, ni para el desarrollo y prueba de instrumentación y medidas; por la falta de personal especializado, así como de laboratorios o instituciones igual que el NBS (National Bureau of

Standards), o la ASTM (American Society for testing Materials).

Necesidades Futuras

Una institución, nacional o privada, es necesaria en Mexico, capaz de proporcionar testificación y certificación de especificaciones de instrumental de características conocidas para la medición de valores meteorológicos, asi como procedimientos estandarizados para el procesamiento de información meteorólogica y de calidad ambiental y facilidades para el mantenimiento de instrumentación. Este laboratorio también debe proporcionar los servicios de calibración y calificación certificada de instrumental y sistemas de publicación, asi como entrenamiento de personal, a través de cursos teórico-prácticos de los procedimientos probados y estudiados para su correcta interpretacion y aplicación de producción de estándares.

NON-FORMAL ENVIRONMENTAL EDUCATION, AN EFFICIENT METHOD FOR NATURAL RESOURCE PROTECTION

Juan Miguel Sanchez Montero
San Jose, Costa Rica

Past experiences showed us represive vigulance has not been as effective as it was believed it would be. Instead of, or as a complemente of represive vigilance, interestint non formal environmental education programs should be developed in such a way that the social component is to be introduced so the real citizen needs can be taken into consideration. This presentation will be in this direction.

SOMETHING OLD, SOMETHING NEW, SOMETHING BORROWED, SOMETHING GREEN

Sharon Morse
Naches, Washington

Ways that a public agency is using time-honored techniques of environmental education and interpretation to reach out to its audiences in a new way: Taking the Forest to the People, or How to Teach an Old Bear New Tricks.

THE CEDARS-CIMARRON ENVIRONMENTAL DISCOVERY ADVENTURE AND RESEARCH FOR STUDENTS

Christine Moseley
Oklahoma State University
Stillwater, Oklahoma

This workshop will demonstrate the steps involved in a community organization and implementation of an outdoor study site for children. Girl Scout groups were targeted. Future plans include incorporating Boy Scout, Church Youth and 4-H groups, with public school groups eventually utilizing the nature program as part of their yearly curriculum.

THE GOLDEN LION TAMARIN CONSERVATION EDUCATION PROGRAM DEVELOPMENT AND EVALUATION OF THE EDUCATION AS A CONSERVATION TECHNOLOGY FOR AN ENDANGERED SPECIES

Elizabeth Nagagata
Lou Ann Dietz
Silver Spring, Maryland

The golden lion tamarin is an endangered specie, which only exists in the state of Rio de Janeiro in Brazil. Since 1983 the Golden Lion Tamarin Project has been in existence to protect this specie. An integral part of the project is the Conservation Education Program. One objective of this program is the development of a methodology which can be used in other environmental education programs in Brazil to protect other endangered species. The successful activities of the program indicated by the results of evaluations, will help develop the methodology and serve as an example for other projects.

THE USE OF A NATURE RESERVE AS AN ENVIRONMENTAL EDUCATION TOOL

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Abstract

Our Environmental educational program is carried out in Campo Grande at a small reserve. It is directed to basic and intermediate students. It includes interpretive trails, activities at a forestry nursery, visits to the wildlife treatment center, film exhibits, games and other activities. The success of this program will be discussed.

I Introduction

The present work has been carried out during the year of 1989 in a small nature reserve placed in Campo Grande, a medium size town, Capital of Mato Grosso do Sul (Brazil), Population, 800.000.

Created in 1981, this ecological reserve is the only protected area in the state guaranteed by law. The environmental state Agency (SEMA) is its responsible managing institution.

In the city limits, the reserve is a small but continuous area (120 ha) with a gentle relief and tow springs draining into a narrow stream called "Corrego Prosa." In addition of its historical value for the city foundation, this stream represents an expressive amount of water supply.

A dense and typical "cerrado" vegetation harbors a marvelous diversity of wild animals, including some endangered species such as the giant anteater (Myrmecophaga tridactyla), groups of smalla tamarins (Callithrix penicillata), coatis (Nasua nasua) among others.

These circumstances contribute to make the reserve a living lab where educational purposes will be successfully done.

II Methods

The project was addressed to all school age children and the main objective was to lead them to wilderness areas inside the reserve to see native wildlife and to learn how people's misuse of this land threatens these creatures' delicate ecosystem.

Seeking for better results a program including all activities, schedules and warnings were previously and carefully planned by the environmental education department teamwork, managing for a very reasonable use to the reserve's educational resources. This program was sent to all schools in town and the visits were opened since April 7, 1989.

Biologist of the Environment State
Agency of Mato Grosso do Sul (Brazil)
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Each group of visitors constituted a maximum of forty students. They were subdivides in smaller groups of ten, each followed by one nature interpreter who carried them into a four stage program including:

Two interpretive trails where the differences between primitive and secondary plant growth could easily be seen. Along the walk, they also could find out how soil is formed, explore the different types of soil and take a close-up look at the variety of creatures that make their homes in soil and how people's misuse of the land is causing devastating soil erosion. In depending to the group's concentration, they could eventually see some wild animals passing across the trails. Birds and some smaller mammals were very common.

The water resources formed by the double headed stream basin and drainage were also a visited area. There, the interpreters showed the children how freshwater habitats support wildlife, what threatened our water supplies, and how we can conserve this vital resource.

In the Forestry nursery the students could see more closely all plant species (especially trees) seen along the trails, learn all about the native plants, its cultivation, seed collecting, and storage processes. They also could see the compost made of decaying organic matter, such as leaves and manure, used as fertilizer. Waste and recycling, were too discussed themes.

In the Wild Animal Center they were introduced to many animal species never seen so closely and this was the most delightful part of their journey. The center's function is to promote injured wild animals convalescence, and nursery to orphan offsprings, after that they would be reintroduced to their original habitats. More than thirty species has passed through the center in 1989. Among them, there was a very little baby jaguar and two anteater babies that had to be artificially fed with nursing bottles and so becoming very docile. Considerations about the reasons why wild animals should not be kept as pets were extensively expressed by the specialists working in the center.

After these four stages the groups joined in the visitors center to see a film and to perform other activities especially prepared according to their ages and school level.

III Results

The project started in April 7, and 8000 children were until December 20. The school demand for a visit was and still are very intensive. They often have to be settled two months ahead of time.

The notes left in the visitor's book (always after the visit) showed that this program would be helpful to introduce or review some subjects in the classroom, especially for science, geography, history and art's teachers.

Elementary and preschool teachers found the program a little tiring for their children. So, we reduced their circuit walk to just one interpretive trail. Even thus, they all agreed about the program value, particularly related to plant and animal approaches.

Despite no scientific methods to evaluate these results were used, it seems that the program stimulated many teachers to get involved with other activities held by the environmental state agency such as courses, welfare works, and ecological celebrations.

IV Difficulties

As the environmental state agency didn't have a self bus to carry the scholars from school, we had some regular troubles with schedules.

At first, some teachers didn't understand the educational meanings of the project, taking their children just to a leisure time in the reserve.

Warnings about venomous snakes sometimes were not taken very seriously; to prevent accidents all children should wear proper clothes and shoes.

To Brazil public administration to environment is always a troublesome matter. Political influences may not consider these small actions as priorities for the future.

V Final Considerations

After eight months we could feel this small project significance beyond the teaching staff. This program describes now, through balanced management, we can use and enjoy this public land and conserve our finite resources too. It also stimulated new protected areas demarcation once the reserve program was not enough to consider all the urban community.

VI Acknowledgements

The author is indebted to all the Environmental agency staff for valuable cooperation and especially to all teachers and students who made this project possible.

EARTH MATTERS--A CHALLENGE FOR ENVIRONMENTAL ACTION

Donna L. Nye
Chris Bergerson
Girl Scouts of the U.S.A.
New York, New York

This workshop will introduce our organization's new contemporary issues booklet and slide show focusing on environmental education. Participants will take part in activities designed to empower youth and adults to take action to protect our environment. Environmental action projects undertaken by our membership will be highlighted.

EMPLOYEES TURNING THE CORPORATE INVOLVEMENT TIDE

Elizabeth Anderson Olson
Enron Gas Pipeline Operating Company
Houston, Texas

Scene One..Corporate America, intent on "bottom line", neither time nor wish for unprofitable involvement. Scene Two..Enter force on Horizon..employees insisting on collecting/recycling within own cubicles. Sincerity..a force with which to recon. Final Scene..Corporation decides to join "distant drummers" in self-defense. Institutes corporate-wide program.

THE CONSERVATION OF THE BLACK LION TAMARIN THROUGH ENVIRONMENTAL EDUCATION

Suzana Machado Padua
University of Florida
Gainsville, Florida

The black lion tamarin (Leontopithecus chrysopygus) is one of the most endangered species of primates in the world. In the wild, this primate survives in only two reserves in the State of Sao Paulo, Brazil. This Program was designed to divulge the Park's biological value and offer an opportunity of visiting groups of a direct contact with nature, in order to increase the appreciation of the natural world. The effectiveness of pre-visit strategies was measured in a quasi-experimental design. The results show that there is a significant difference between the groups that were prepared beforehand for the visit, and those who did not receive treatment.

E.E. ON THE T.V. IN THE NEW ELECTRONIC AGE

Douglas Palenshus
Oklahoma State University
Stillwater, Oklahoma

Subject is the availability and application of full motion video teleconferencing by satellite for information exchange and public education. Videotaped segments of planning and productions and examples of environmentally related teleconferences will be included. A case study of the teleconference "Corporate America and The Environment" will also be discussed.

NON-FORMAL ENVIRONMENTAL EDUCATION TO ENHANCE COMMUNITY PARTICIPATION IN BIOSPHERE RESERVES

Ofelia Perez Pena
El Grullo, Jalisco, Mexico

The philosophical concepts and methodologies which should guide non environmental education in biosphere reserves is presented, to promote the production and self-organizing processes in the communities, pertaining to conservation, sustained use and social development issues. Guidelines to be considered to work from theoretical to practical setups are also considered.

ENVIROMENTAL EDUCATION AT RIO GRANDE WATERSHED
EDUCACION AMBIENTAL EN LA CUENCA DE RIO GRANDE

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Departamento de Biología
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Honduras

Abstract

The Rio Grande Watershed supplies the water for the Concepcion Dam. The primary purpose of the dam is to give potable water to capital city Tegucigalpa. This watershed has serious problems with pollution, due to pesticides, deforestation and fires. This paper is about a pilot project in non-formal environmental education at the Rio Grande watershed.

La cuenca del Río Grande o Concepción se encuentra ubicada al oeste de Tegucigalpa, capital de la República de Honduras, América Central, con un área de aproximadamente 135 km^2.

En esta cuenca se construye un embalse que estará terminado en 1990, para abastecer en un 45% las demandas de agua potable para la ciudad. (capacidad máxima para 800,000 personas). Es un proyecto de aproximadamente 27 millones de dólares de inversión.[1]

La cuenca presenta elevaciones que van desde los 1,110 m.s.n.m. hasta los 2,175 m.s.n.m. El 78% de la cuenca corresponde a pendientes mayores del 15%.[2]

El promedio de precipitación anual es de 1243 mm. y el promedio anual de temperatura 20.7 grados Centígrados.[3]

En el área se encuentra una población de 2,388 habitantes, con un 45% de niños menores de 10 años. El 80% de la población económicamente activa se dedica a las actividades agrícolas.

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[1] Ramirez,M. y E. Ordoñez.1989. Plan de Manejo integral de la Cuenca de el Rio Grande o Concepción. Servicio Autónomo de Acueductos y Alcantarillados, SANAA. Tegucigalpa.

[2]. Idem.

[3]. Idem.

El grado de analfabetismo en la cuenca llega hasta un 45.2% Se encuentran 11 escuelas con 1,200 alumnos y 12 maestros.[4]

Problemas ambientales encontrados en la cuenca

1. Contaminación por agroquímicos: se han encontrado clordano, BHC, endosulfan, heptacloro, aldrín y DDT en las muestras de agua, tomadas en distintas partes del río. Todos estos contaminantes por encima de lo recomendado por la EPA.[5]

2. Contaminación biológica por:

   a) Disposición de basuras y excretas humanas al aire libre.

   b) Desechos provenientes de granjas agrícolas y pecuarias.

3. Conflictos en el uso de la tierra:

   a) Agricultura de ladera sin obras de conservación
   b) Uso del recurso forestal para leña y resina.

En 1990 el Departamento de Biología de la UNAH, a traves de la asignatura de Ecologia General, comenzó una labor de educación ambiental en la cuenca, con un profesor titular, un instructor y 12 alumnos. La labor fue orientada hacia tres grupos de personas:

a) campesinos hombres
b) mujeres
c) niños.

En el caso de los campesinos los alumnos recibieron entrenamiento previo en agricultura de ladera, sistemas ecológicos en agricultura, abono verde, aboneras, etc. para luego trabajar con los campesinos y presentar alternativas de solución. La meta es crear sistemas demostrativos agroforestales y de conservación de suelos donde los campesinos puedan aprender nuevas técnicas.

Con las mujeres se trabaja dándoles información sobre higiene e intensificación de la huerta familiar para mejorar la productividad.

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[4]. Censo Poblacional. 1974.

[5]. CATIE. 1989

Con los niños se está trabajando según el método del proyecto WILD, dándoles talleres en las escuelas.

Al final del año se hará una evaluación entre la población con el objeto de ver si la actitud de las personas ha cambiado, aun cuando se sabe que ha sido un período corto de trabajo. Este es un proyecto que continuará cada año , esperando aumentar su intensidad.

AIR POLLUTION VIDEO TRAINING-DEVELOPMENT, IMPLEMENTATION, ADVANTAGES AND LIMITATIONS

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Abstract

Formal degrees in air pollution control do not exist in college curriculums. Therefore, air pollution staff must rely on a different type of training for their professional education. The advantages and weaknesses of using video tapes as a training resources will be discussed. The development and production of an air pollution video tape will also be described. Lastly, the paper will discuss how the California Air Resources Board has integrated video tapes into its training programs.

Background

The California Air Resources Board's Compliance Division conducts approximately seventy-five training courses each year, ranging in size from five to almost two hundred air pollution control professionals. While much of this training is intended for entry level county inspectors, some is also directed at journey and enforcement managers. Because degrees in air pollution control are so rare, air pollution control professionals rely heavily on workplace resources for their professional educations.

Among the tools we have applied to this task is prerecorded video tapes. The most obvious advantages of this approach include uniform lesson content and potential by widespread distribution. The big disadvantage is the capital cost. In developing customized training materials, video will not always be the best tool.

How can you identify appropriate training applications for video? We have formulated a few key questions to help decide whether it is advantageous to further investigate the video option. These questions are based on experience developing numerous customized training video for various air pollution training courses in California.

1. Is the Material Visual?

This is the toughest and most important question to answer. The traditional instructor seeks to convey concepts which are often not visual. To do this may require the creation and connection of a series of visual images.

Let us clarify that the word visual is not intended to be synonymous with visible. The medium excels at presenting the imaginary and the invisible. Vibrating molecules and the insides of operating machinery can be engaging images. On the other hand, a video addressing the legal actions resulting from damages caused by a source of air pollution might present such artistic challenges as: What does a headache look like? How does one visually demonstrate the distinction between two different legal actions?

The point here is that educators must identify the potential for visual representation in the material before allocating any funds for production. The best tool for this is the storyboard.

With a storyboard the technical points made in the script are laid out next to the high impact images that will solidify the concepts in the viewers minds. At this stage if your storyboard shows anything less than a wealth of visual images, other less costly training options should be considered.

2. Is Motion Essential to the Message?

For those educational objectives requiring students to associate specific sounds or objects with specific concepts or tasks, video is an excellent choice. Action may also be used to demonstrate a kinesthetic skill. However, physical skills may also be taught just as effectively and more inexpensively with a series of still pictures. If motion is not essential to the message, we would want to avoid surrendering the strengths of other media by "televising" a slide show or lecture. For example, a map or electrical diagram are both visual tools, but detailed study of a single image is much better suited to handouts.

3. Is Location Visually Relevant?

Perhaps the single largest advantage and the most vigorously exercised property of video is its ability to compress space and time. What that means to instructors is that they may travel with a camera crew to various of places over a period of weeks (suffering the normal delays) and record many hours of tape. The final edited product of this process can be a highly selective and compact record of the journey which will transport a room full of students to each location and show them exactly and ONLY those things they need to see in a few minutes. The time and distance covered traveling is compressed out of existence for the viewers.

Because a large part of television's allure is associated with our expectation that within five seconds we will be transported to a completely different visual space, instructors can satisfy viewers' expectations for action with meaningful scene changes.

Therefore, if educators determines that visiting a multitude of locations is advantageous, it is likely that using videos will be less costly rather than a class. If, on the other hand, a single location will prove adequate, and reachable, taking the students on a field trip to that site may be more appropriate. During such a visit students may select their own "camera angle" and view the subject in greater detail than can be reproduced on videotape.

4. How Many People Need this Training?

The obvious advantage for using video training in larger companies (n greater than 50 people) is that simple material such as new employee orientation can be offered by top management personnel whose enthusiasm is captured on tape. While the basic training for environmental specialists is considerably more technical than a new employee orientation, the need to deliver the same information again and again is similar. With such a program, magnetically stored, air pollution managers can save time on training and know that each staff person has been given the same key points. The staff may view video tapes at their office when time permits. If particular concepts or points are difficult, staff can then review selected sections as often as necessary.

5. Will it Save You Money?

The capital costs of producing a professional quality video program ($600 or more per minute) can be intimidating. Take a moment to ask yourself how many new employees you trained last year. For a given program area, how much time did each of your experienced staff spend reviewing that material? Also, are you sure that all of the new employees know all that they should? When one of your experts finds another job will you be able to transfer the basic information to the new employee in a format that they are able to use?

6. Is the Material Subject to Change?

The cost of editing video does not compare well with the cost of changing slides and printed material. Since very few environmental educators have easy access to a video editing studio, regular changes in taped materials would be inconvenient as well as expensive. Therefore, materials subject to constant change might best be presented with more easily edited training media such as slides.

7. Is Quality Within Your Reach?

Today, camcorders and home video units make cinematography as convenient as 35 mm slides. Certainly, any instructor can take advantage of the space-time compression properties already discussed, but the production of a full program complete with dialogue should only be undertaken with professional equipment and staff for the following reason. Everyone is a critic, and most watch the best television money can buy every day. Even after you have reminded your students that your training film is not intended to compete with music videos for flash and polish, they are likely to be distracted by technical errors and poor quality. Therefore, producers have a responsibility to make the highest quality product that they can afford.

Summary

The cost of producing a custom training video tape may be offset by the value added to the training product when the material a) can be depicted visually, b) must be viewed at diverse locations, c) will be shown repeatedly, d) includes a rare or unphotographable, event or action and, e) is not likely to change frequently. Video may also be helpful when students will be asked to respond to specific sounds or objects.

On the other hand, simpler formats may be more cost effective when the material is less visual or static, when it is feasible to devote a staff trainer to a small group or when the information is likely to change.

We have shown a variety of circumstances that might motivate environmental educators to integrate video taped training materials into the classroom. We hope that this will assist readers in selecting the appropriate training tool to maintain a motivated and informed staff.

THE CAMP TYLER OUTDOOR ENVIRONMENTAL EDUCATION PROGRAM

Dr. Robert E. Raze, Jr.
Debra L. Raze
Indiana, Pennsylvania

Outdoor environmental education programs, such as the one at Campt Tyler, the oldest continuous outdoor residential environmental education program in the state of Texas, are possible solutions to educate our students about the environment, our relationship to the earth, social skills, peer relationships, teacher/student relationships and an understanding of ourselves as individuals.

NON-FORMAL PROGRAMS: STRATEGY AND IMPORTANCE TO STIMULATE ENVIRONMENTAL EDUCATION IN VENEZUELA

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Abstract

Venezuela just like many other developing countries has promoted environmental education programs at all school levels. The non formal activities have brought extraordinary results through the use of integrated didactic strategies using scientific media centers and natural protected areas as didactic framework.

PROGRAMAS NO FORMALES: IMPORTANCIA Y ESTRATEGIA PARA IMPULSAR LA EDUCACION AMBIENTAL EN VENEZUELA

Antecedentes

Venezuela, al igual que muchos otros paises pertenecientes al Programa de las Naciones Unidas para el Medio Ambiente (PNUMA), ha impulsado las actividades ambientalistas en los ltimos veinte años y para ello ha incorporado planes docentes en la totalidad de los niveles académicos, con el propósito de "educar" al ciudadano en la protección y uso racional del medio ambiente. Para cumplir

con esta responsabilidad los entes gubernamentales responsables de dirigir al país en educación y manejo de los recursos naturales han diseñado e incorporado contenidos programáticos en los planes curriculares del sistema educativo venezolano, incluyéndose en ellos desde los objetivos básicos del aprendizaje hasta las habilidades y cambios de conducta deseados. De esta manera se ha completado la programación docente formal en el sistema educativo venezolano. No obstante de esta gran iniciativa aportada por los entes gubernamentales referidos anteriormente, gran parte del sector público, y especialmente población adulta, no esta siendo atendida por estos programas y tan sólo las Organizaciones No-Gubernamentales (ONG), han impulsado la necesidad de brindar a este sector poblacional programas educativos para promover en ellos una mejor actitud en la conservación del ambiente y sus recursos naturales. Esta iniciativa representada en su mayoria por instituciones privadas promete fortalecer los planteamientos educativos necesarios para la preservación del medio ambiente a través de las actividades docentes no-formales.

Necesidades y Expectativas Ambientalistas

Ante la incipiente amenaza en que se encuentra el medio ambiente se hace necesario examinar detalladamente las necesidades y caracteristicas de la población a quienes se quiere educar con criterio de conservación ambiental. Por otra parte se hace necesario establecer detalladamente las expectativas de manera prioritaria, de tal forma que las estrategias referidas a cualquier programa ambientalista no se deje solo en las manos de los docentes y grupos escolares participantes de su misión educativa. Es por ello que muchos especialistas en Educación Ambiental insisten en las busqueda de las mas efectivas fórmulas para promover actitudes ambientalistas en la población. Una de las modalidades sugeridas es la referida por Ben-Peretz (1980), quien señala que la Educación Ambiental debe ser concebida como una meta continua de la sociedad, en la que deben incluirse los mas diversos sectores poblacionales y escolares, que abarquen desde el kindergarten hasta los programas de Educación de Adultos. Es por ello que se hace necesario incorporar en programas ambientalistas la mas amplia representación de grupos y organizaciones conservacionistas con el propósito de amplificar y catalizar la acción de los programas formales de Educación Ambiental.

En la búsqueda de estos logros, las ONG en Venezuela han dirigido sus esfuerzos a consolidar, no sólo los contenidos ambientalistas de la educación formal sino a expander sus alcances y metas a sectores poblacionales generalmente atendidas o desatendidas por las instituciones gubernamentales a traves de programas educativos no-formales. Parte de estas estrategias y sus respectivos elementos coinciden con los referidos por Lazarowitz and Hertz-Lazarowitz (1977).

Capacitación y Programas de Entrenamiento

Parte de la estrategia de todo plan educativo ambientalista es considerar la incorporación de actividades de entrenamiento y capacitación dentro de sus programas. Muchos paises han extendido estas exigencias a profesionales y personal técnico vinculado a la planificación de desarrollo económico de manera que estos atiendan los requerimientos y metas del plan de Educación Ambiental en sus actividades profesionales. Venezuela ha atendido esta necesidad y como parte de una estrategia ha incluido en la curricula de todos los niveles escolares contenidos temáticos y/o cursos específicos para promover la conservación del medio ambiente y la utilización racional de los recursos naturales. Paralelamente se ha iniciado un plan de adiestramiento de docentes en servicio por parte del Ministerio de Educación, con el propósito de garantizar la efectividad del recurso humano en su participación y liderazgo dentro de la comunidad, especialmente cuando este cumple funciones de planificador y ejecutor de mensajes ambientalistas en actividades educativas formales como no-formales. Nuevamente para los sectores escolares se ha garantizado la participación de estos docentes entrenados, pero para la población no escolar y adulta, la acción de este recurso humano ha sido escasa o nula.

Con la participación de las ONG y la dirección de estos docentes especializados se estan diseñando acciones ambientalistas. El propósito de estas actividades, es la de proyectar la acción de este recurso humano, y que ellos se conviertan en verdaderos líderes ambientalistas para los grupos comunitarios de manera que estos a su vez promuevan la solución de problemas en la búsqueda de mejor actitud y percepción de su medio ambiente.

La integración de los programas educativos y el adiestramiento

Muchos modelos educativos han intentado mostrar las fórmulas mas efectivas para integrar estos dos componentes en los planes de Educación Ambiental. Uno de los mas adaptados a la situación y realidad ambiental venezolana es el referido por Johnson (1980), en el refleja el principio catalítico adoptado por la UNEP en el área de Educación

Ambiental. En este modelo los programas formales y no-formales están representados por las actividades básicas que se contemplan en los planes de la UNEP para cada uno de los componentes docentes del modelo. En estos se incluye desde los contenidos de formación ambiental para cada nivel académico (básico, secundaria y universitario) que corresponden a los programas formales de la Educación Ambiental, hasta las sesiones extra-académicas y de formación complementaria para jóvenes y adultos que se identifican en los programas no-formales de esta disciplina ambientalista. Toda esta acción integradora de los componentes docentes, unida a estrategias y metodologías apropiadas para el logro de objetivos pre-establecidos, llevan a que la formación ambiental se manifieste en los educandos en acciones concretas: en el conocimiento, actitud y habilidad para lograr una mejor calidad del medio ambiente.

Pero la acción docente se hace improductiva si los programas de capacitación no se integran de manera constante en los programas educativos, de tal forma que el recurso humano especializado garantice en alto grado la operatividad de los planes de Educación Ambiental mediante la formación óptima de los educandos.

Modalidades instruccionales y esquemas de aprendizaje

Desde que las actividades de Educación Ambiental se incluyeron en los diferentes programas escolares a nivel mundial, los investigadores de la docencia se han propuesto diseñar los mas efectivos modelos instruccionales y esquemas de aprendizaje que respondan a las necesidades del educando en su formación ambiental. Una de las propuestas que incluye un amplio sustento de teorías educativas, ha sido la de Joseph Novak (1980). En su propuesta no sólo se incluyen antecedentes teóricos, como los de Ausubel, Gowin y Bloom que reflejan confiabilidad en su modelo educativo, sino que permite conceptualizar la importancia de las actividades extraescolares en los programas de formación ambiental. Principios básicos de la Educación Ambiental; como los de continuidad en el proceso de formación y la integración de los aprendizajes unidos a los fundamentos de jerarquización del conocimiento que ha de demostrar todo educando en su formación, indican que las actividades no-formales deben ser consideradas como estrategias instruccionales de uso permanente en el aprendizaje.

La integración de los conocimientos adquiridos y su afianzamiento cognositivo sólo se podrá lograr mediante actividades de refuerzo y de naturaleza vivencial que sólo podrán darse mediante sesiones de aprendizaje no-formales.

Los escenarios didácticos y los programas no-formales

Con el propósito de trasmitir a los educandos la mas precisa realidad del medio ambiente, el componente docente del programa UNEP contempla entre las actividades de la Educación no-formal, diferentes sesiones dirigidas a fortalecer y reforzar los alcances de los programas puramente académicos. En este mismo componente se incluyen otras actividades de naturaleza vivencial para niños, jóvenes y adultos, con el propósito de satisfacer las expectativas de cada uno de estos grupos en su correspondiente motivación y adquisición de compromisos por una cada vez mejor calidad ambiental. Parte de estas actividades han estado representadas por talleres, campamentos juveniles y sesiones de juegos ecológicos como parte de las estrategias didácticas convencionales contempladas por el programa UNEP. Pero a partir de estas experiencias extraescolares se hace necesario ampliar la diversidad de ambientes de instrucción, de manera que el ambientalista en formación pueda experimentar una situación de aprendizaje vivencial debidamente adaptada a sus características cognositivas y de actitudes hacia el medio ambiente. Por otra parte la ampliación de escenarios o **Centros de Formación Ambiental** (como comúnmente se han denominado) permite amplificar las técnicas didácticas hacia un óptimo logro haciendo que la participación del individuo sea activa y de vívido contacto con el medio ambiente durante sus experiencias de aprendizaje.

Las nuevas actividades no-formales estarán desarrolladas dentro de ambientes de aprendizaje **"in situ"** donde el medio instruccional y el recurso didáctico estén representados por el propio escenario de un área natural protegida o el de otro ambiente docente que se dedique a concientizar al visitante en la conservación de sus recursos naturales (Rivero 1989). Las mismas necesidades educativas requeridas para la preservación de áreas naturales protegidas, como Parques Nacionales y Recreacionales, y los fines de los centros de estudio y divulgación de los recursos naturales, tales como museos y jardines zoológicos y botánicos, coinciden con requerimientos instruccionales y sus correspondientes estrategias docentes de los programas no-formales de la Educación Ambiental. Es por ello que actualmente se diseña un modelo operativo para los **Centros de Formación Ambiental** donde sus componentes integradores están representados por los Parques, Centros de estudio y divulgación y los propios planteles escolares. Cada uno de estos componentes mantiene una estrecha interdependencia y vinculación de sus planes y propósitos, coincidiendo todos ellos en la formación y capacitación del individuo en materia

ambiental, asi como en el conocimiento de sus recursos naturales y su conservación.

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KEEP THEM SAFE, HELP THEM LEARN, HELP THEM GROW

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A three-faceted leadership model for environmental education field programs will be discussed. The three facets of logistical, technical and interpersonal leadership interact when designing and implementing field experiences. How they interact and planning for all three needs helps improve the quality and chances for success of field program.

INTRODUCING THE NETWORK FOR PUBLIC DEBATE'S ENVIRONMENT AT ISSUE MEDIA CAMPAIGN

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Abstract

The Network for Public Debate, a joint effort of the Public Agenda Foundation and the National Issues Forums, works with local media in communities across the country to sponsor education campaigns on environmental issues. Come see how an ENVIRONMENT AT ISSUE media campaign can happen in your city!

"What should we do about growing risks to our environment?" Where does the public stand on this issue? How can we encourage thoughtful public responses on the environment beyond the top-of-the-head reactions tallied by the latest polls?

The Network for Public Debate not only asks the public what they think about critical issues, it provides a mechanism for the public to learn about these issues and then for the public to express its informed voice. Each Network campaign offers an exceptional community service opportunity. One goal of this program is to enhance public understanding of complex issues.

Founded to encourage informed and fair-minded debate on public issues, the Network for Public Debate is a collaborative effort of the Public Agenda Foundation, a nonpartisan, nonprofit research and communications organization founded by Daniel Yankelovich, and the National Issues Forums (NIF), a consortium of colleges, universities, civic and community organizations that convene annual public discussions forums.

The Network for Public Debate works with newspapers, television and radio stations in communities across the country to sponsor media education campaigns that give people a chance to say what they think about the environment and other issues of public concern. Through a series of coordinated activities that feature in-depth TV and newspaper coverage, community-wide distribution of educational materials and public forums, the public can think seriously about what can and should be done about the environment. The Network challenges citizens to consider what should be done by government, by business and industry, and by individuals in their roles as homeowners, consumers, commuters and taxpayers.

The month-long campaigns are nonpartisan, carefully researched, and tested to ensure that all points of view are presented fairly, accurately and in a balanced fashion. The Network produces documentaries, public service announcements, print ads, a special newspaper supplement and the culminating ballot. The Network's materials examine issues from the national perspective. Therefore, while the Network provides ample materials for print and broadcast media, it leaves the local coverage--and the impact the campaign choices could have on a participating community--to the local media sponsors.

The campaign gives the public an opportunity to learn about tough choices that must be made in order to address the problems facing the environment. Once they learn about the pros and cons of available options, they make their views known by filling out a campaign "ballot." The results are tabulated and reported back to the community and its decision makers by the sponsoring media. Through these ballots, the public is able to tell its community and policy leaders how it thinks we should approach environmental protection.

The Network campaigns have met with enthusiastic responses from all those involved. In a recent Network DRUGS AT ISSUE campaign, the media, community and national leaders affirmed the importance of the campaign's approach to addressing the drug crisis:

> "We believe that this program, the news features that will follow, the final ballot analysis program that we will present, as well as the contributions from our media partners, WSYR and the Herald-Journal, represent the most significant and successful community oriented project in which this station as ever participated."
>
> A. Stephen Kronquest
> Vice president, general manager WIXT-TV
> Syracuse,NY
>
> "The Network for Public Debate's Drugs at Issue project in Syracuse was a stunning success. We opened the campaign with a televised forum with some three hundred participants and a news conference with Stan Lundine, New York's Lt. Governor. The extensive month-long coverage and the forty community forums which took place generated broad based community support that resulted in the return of over eight thousand ballots.

Joe Julian
NIF Convenor
Director of Civic Education
Maxwell School of Citizenship and
Public Affairs, Syracuse University

"Drugs at Issue is a unique concept worthy of future replication elsewhere in New York and across the nation. The campaign represents a truly grassroots, community effort to address the complex nature of the drug problem."

Stan Lundine
Lieutenant Governor
New York

"The program has made the Central New York community aware of the spread of drug use. It has presented the community with the options we have to fight back. Perhaps most importantly, it has given the people the opportunity to tell their elected representatives that they are willing and able to do all that they can to end this drug nightmare."

Alfonse M. D'Amato
United States Senator
New York

These responses are typical of the comments made by those participating in a Network campaign. The new ENVIRONMENT AT ISSUE campaign provides the same opportunity to have thoughtful discussions on the key issues concerning the environment.

The ENVIRONMENT AT ISSUE campaign focuses on four key air quality issues: acid rain, depletion of the ozone layer, global warming and smog. The Network's documentary and special newspaper supplement provide background information on each of these issues. For each of these issues, the public is asked to consider the such questions as:

Given what we know and don't know about the severity of our environmental problems, what should we do?

How much environmental risk are we willing to live with?
What are we willing to give up in order to protect the environment?

What personal sacrifices would you be willing to make to protect the environment?

What trade-offs are you willing to make to protect our environment?

What should business and industry do to respond to environmental problems?

Should the U.S. take the lead toward a cleaner environment?

Should we take action immediately or wait? Should we wait for more scientific evidence?

The newspaper "ballot" poses these questions in terms of the air quality issues. The questions are worded such that there are no simple "yes" or "no" answers. The Network materials illustrate that none of these solutions are cost-free, and tough choices are necessary.

The Network has received endorsements and support from major environmental groups, including William Reilly of the EPA, Earth DAy 1990 and the PBS Save the Earth project. PBS is highlighting the ENVIRONMENT AT ISSUE campaign as an important community education project in a resource packet they are sending to member stations, as well as education and community groups.

The Network has had a very exciting and successful pilot year and looks forward to many ENVIRONMENT AT ISSUE campaigns in the near future. The following media groups are currently considering campaigns: Berks Community Television and The Reading Eagle and The Reading Times in Reading, Pennsylvania; the Columbus Ledger-Enquirer and WTVM-TV, an ABC affiliate, in Columbus, Georgia; the Mobile Press/Mobile Register and WKRG-TV, a CBS affiliate, and WKRG Radio in Mobile, Alabama, Macon Telegraph News and WMAZ-TV Channel 13, a CBS affiliate, in Macon, Georgia and the Anniston Star and WJSU-TV, a CBS affiliate, in Anniston, Alabama. The Network staff has also had promising meetings in California, Florida, Indiana, Kentucky, Ohio, Tennessee, and Virginia.

The ENVIRONMENT AT ISSUE campaign is available without charge to interested broadcasters, publishers and community groups through the Network for Public Debate. Those interested in bringing the campaign to their local community should contact Cynthia Rapp, Network for Public Debate, 1667 K St. N.W., Suite 900, Washington, D.C. 20006. (202) 457-9270.

CONFAB ON AMERICAN NATURE CENTERS
GUIDELINES FOR MANAGEMENT

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Abstract

Guidelines for nature center leadership issues were developed by a unique gathering of national leaders in December 1989 at Chautauqua Institution (NY). An overview of the guidelines will be presented at this session. They offer guidance on how to develop a) an effective education program, b) how to work with architects, and c) how to develop a nature center funding program.

The Roger Tory Peterson Institute (RTPI) seeks to promote the emotional and intellectual linkages of people, especially children, to nature. It created an opportunity to bring together and learn from a small group of America's leading nature center professionals. These people, and the hundreds more they represent, are doing some of the most exciting and essential work of our nature conservation and environmental effort. They create and direct connections of people, young and old, with the natural world.

According to Websters, a confab is "an informal talk." It is the term RTPI has chosen to denote a series of small conferences involving 15-20 national leaders in nature education. The first confab, The American Nature Center: Leadership for the Nineties, was held in early December 1989 and provided an opportunity for invited representatives from successful nature education organizations from around the country to discuss strategies and define guidelines for practice in managing nature centers. The work centered on three questions related to architectural building programs, education, and funding. A formal process of facilitated small group discussion promoted an open exchange of thought based on successful experience. Guidelines were prioritized and listed in a set of recommendations that have been summarized below.

Architecture

It became clear during the deliberations that it was not an uncommon experience to have a major building projects become out of control. Control and project management are central concerns of people who have been through the process of managing a major capital building project from start to finish. You only get one chance and because of the expenses involved it has to be right the first time. A set of recommendations were developed for how to select an architect and manage a capital building project in a way that will assure successfully meeting your goals within established budget parameters.

1. Manage the vision. Blend creativity and enthusiasm with practical limitations to achieve conclusive decision making. Design and understand the philosophy of the entire project. Maintain a concern for how the project fits your community as well as your center. Adhere to a holistic mission and hold sight of environmental ethics and established goals.

2. Develop a functioning, dynamic project team to work with your architect to design an appropriate facility from the initial concept through construction. It is recommended that a 6-8 member committee be established to work directly with the architect and to serve as liaison with your board and your staff. It is most important to choose a chairperson who is a respected leader and who can establish ground rules for decision making from the beginning.

3. Design for appropriate environmental technology. Make certain that important functions of your center determine the architectural design and not the other way around. The end product must work! Be certain also that building and/or site leaves visitors with an impression that is in harmony with nature. For example, the design should use energy conscious utilities and require the lowest possible maintenance.

4. Establish a procedure to manage the process of selecting and managing the architect. Here, the importance of a clear decision making process can not be overstated. Determine who on your team is responsible for various parts of the process such as developing requests for proposals and selecting the architect. Develop a table of organization that everyone involved understands. Establish a master plan that includes time lines. Conduct a feasibility study.

5. Have an ongoing design process. Appoint an external review committee. Establish a schedule of meetings and progress reports. Establish a clear, written procedure for making change orders. Remain open to change.

6. Define criteria for selecting an appropriate architect. Consider the following: record of work relationships on past jobs; skills and functions of the firm; history on ability to meet deadlines, credit rating, lawsuits, etc.;

familiarity with planning and zonind laws; and ability to deliver an appropriate environmental message through the design.

7. Periodically evaluate the facility following construction to determine whether it continues to fit your program needs and philosophy. Here it is recommended that an evaluation team be established, made up of the architect, a board representative, the executive director, and appropriate staff.

Education

In a nut shell, education programs need to be both relevant to the needs and interests of end users and remain true to the institution's mission. The importance of defining and keeping the mission visible is fundamental to successful education programs. Ongoing change in light of user needs and program evaluation data must also be stressed.

1. Make services personally relevant. Where possible, focus programs and services on local and personal issues. This recognizes that people, in general, have an interest in and are motivated to learn about issues that directly affect them. Using such issues as "jumping off" points to teach about the environment and nature is effective.

2. Identify who uses your nature center and determine their needs. As an example, if schools are major users (or you would like them to be), review their existing cirriculum requirements and match your offerings to their needs where possible.

3. Promote, market, implement, and evaluate your programming. Develop a marketing plan that reflects an understanding of the markets you wish to reach. Include in the plan, the establishment of personal relationships with media. Maintain an ongoing system of evaluation and revision.

4. Develop an educational mission statement. This should be developed by a group process involving trustees, staff, volunteers, teachers and other user groups. Once there is a consensus, the mission statement should be formally adopted by the Board of Trustees and communicated throughout the organization. Make the mission statement a visible part of your daily operation.

5. Provide consistently high quality programs. This will require hiring well qualified staff as well as a system to evaluate their performance. Like the need to consistently

evaluate adherence to mission, programs must be monitored and modified to keep them up to date and of the highest quality. Recognize the importance of and provide ongoing support to training staff and producing educational materials.

Funding

The three most important contributors to a solid financial footing are planning, planning, and planning. Cultivating a diverse base of donor sources, good media relations, and the ability to maintain a high level of integrity with respect to mission are all the results of good planning.

1. Develop a comprehensive public relations strategy. The first step in fundraising is developing a marketing strategy that assesses your needs, studies your markets, and establishes a time line. Learn how the different media work. Establish a continuing relationship with the media in your area and use them to your advantage.

2. Develop a long range strategic plan that addresses the future of your organization in terms of its mission. The strategic plan deals with questions such as "How do we become what we want to be?" Properly written, it establishes goals, objectives and budgetary constraints. It draws out your organizational chart showing how various functions and people relate to one another. It is recommended that the plan be published and then reviewed and revised annually.

3. Develop a financial plan that expresses your center's strategic goals. The plan must involve operational, capital, and endowment budget components. Apply a strategic framework process that comprises of: time frame, market evaluation, and assessment of both critical needs and necessary products. Identify annual funding priorities to be incorporated in a written funding plan. Define in the annual funding goal a budget for fund raising itself. Develop literature and cultivate funding sources with special events. Key concepts to keep in mind when developing funding sources are "involvement" and "education".

4. Develop a diversity of funding sources. The "dependable" grant from a local industry may dry up in hard times. Creating a broad base of funding sources gives nature centers a safety net and ensures that they are not put in to a position of having to compromise their philosophical beliefs in order to continue to receive funding from a source that may be trying to influence its

decision making. A nature center is urged to conduct donor research and thus become familiar with prominent individuals, organizations, and businesses. Learn their giving patterns and interests. Continually seek out new markets, new members, and create new fund raising events. The staff needs to be trained to promote the facility as an integral part of programming.

Speakers And Participants

Bill Hammond, Ft. Myers, FL; Donald Cook, Bank Street College, NY;
Mike Templeton, National Science Foundation, DC;
Norman Brunswig, SC;
Robert Budlinger, NY;
Marshal Case, CT;
Kathy Cooley, AL;
James Davis, OR;
Charity Krueger, OH;
Mike Link, MN;
Michael Long, CA;
Jenepher Lingelbach, VT;
James Malkowski, MN;
Larry Richardson, OH;
Michael Riska, DE;
Willard Rose, MI;
Maurice "Skip" Schwartz, CA;
Debbie Tewell, CO;
Robert Thomas, LA;
Thea Ulen, TX;
Janeece Webb, CA;
James H. Wilson, MO.

THE ZOO CONSERVATION OUTREACH GROUP

Sandra Skrei
Fossil Rim Foundation
Glen Rose, Texas

The Zoo Conservation Outreach Group represents a consortium of North American zoos that are expanding their conservation efforts beyond their own gates, working with zoos in tropical countries interested in implementing comprehensive conservation programming. Projects of interest to educators concerned with tropical conservation, training, interpretation and endangered species include the "Zoos and Conservation Education" workshop, and cooperative opportunities with zoos and conservation organizations interested in reaching the millions of annual tropical American zoo visitors.

WORKING FOR THE WORLD

Gerardo Morales Soto
San Jose, Costa Rica

The close relationship between all species, including man, needs an environmental education that permits an integral and practical component for the protection and sound use of our natural resources. Local participation in training to resolve general environmental problems must address local and familiar situations.

THE COMPLIANCE ASSISTANCE PROGRAM INNOVATIVE SELF-HELP LITERATURE HELPS REDUCE EXCESS EMISSIONS

Stephanie Trenck
Michael Kashuba
California Air Resources Board
Sacramento, California

Abstract

This presentation reviews the philosophy behind the use of self-help literature, why and how it was created. It covers the source selection process, and the developmental procedure on how industry, state and local government work together to produce, market and distribute these much requested documents. A case study is presented that estimates the emissions reductions realized to date, and also illustrates the increased cooperation and good will fostered between business and the regulators as a direct result of this program.

Background

California has the most severe air quality problem in the nation. To overcome this problem, the California Air Resources Board (ARB) and local air pollution control districts (APCDs) have adopted and enforced increasingly stringent regulations controlling emissions from a multitude of emission sources. Despite this effort, air quality standards have not yet been achieved in most of the state.

The Compliance Assistance Program (CAP) was recently established to augment the existing rule adoption and enforcement system. It is based on the idea that most sources will comply if they understand rules affecting them. The program's purpose is to reduce emissions which lead to air quality standard violations. Program clients include all air pollution sources, especially smaller sources subject to complex rules requiring special knowledge and continuing vigilance to maintain compliance. District staff are also clients because they need information on how to effectively enforce specific district regulations.

The program encourages, through the use of CAP generated literature, increased source self-inspection and self-regulation to lower emissions. The CAP produces source specific literature in various formats. Typically, easily read, well-illustrated handbooks are focused at the industry labor force. Detailed technical inspection manuals are targeted to local district inspectors and industry environmental/safety and compliance managers.

Inception

The program got its start because recent audits of some of the larger districts revealed an alarming number of permitted units operating in violation of air pollution control regulations. In some cases, non-compliance rates exceeded 40 percent. Those abnormally high non-compliance rates were resulting in significant excess emissions. Rules were not being complied with and often were not enforced effectively. Whey was this occurring?

Further investigation uncovered the following information:

1) There were generally poor information networks established between the regulators and the regulated;

2) Facility managers and equipment operators often lacked sufficient knowledge of what the district rules required of them; and

3) District inspectors often lacked sufficient technical source information to conduct complete and consistent inspections. Moreover, since inspectors only visit a facility once or twice a year, they are unable to provide the constant reinforcement necessary to ensure continuous compliance.

Target Audiences

Based on our findings, we determined there were two target audiences requiring compliance assistance: the air pollution control inspector and the facility owner/operator.

District inspectors are highly technical personnel, typically holding university engineering and science degrees. Many have completed post graduate studies. These inspectors and other technical district staff assist in planning control equipment, equipment permitting, emissions tracking, enforcing rules and regulations, and gauging their overall effect in reducing air pollution.

To meet the inspectors' needs, the CAP provides source specific, compliance oriented, technical inspection manuals. The manuals describe the source category and the rule to which it is subject, source operations and control technology. Inspection procedures, including sample inspection forms, are also included and can be used to help guide an inspector through a facility inspection. The format of the manuals is consistent throughout the series of publications and is designed for easy reader access to needed information. To ensure that all information remains current, CAP staff keeps a record of registered users who are provided with updated information as the need arises. Users are also encouraged to send information to CAP which will improve the manuals. The manuals are also used as training texts for air pollution control inspectors. To date, ARB staff have provided instruction in the inspection of gasoline vapor recovery, solvent cleaning operations, and metal parts coating operations.

Our second target audience, the facility owners and operators, are more difficult to categorize. Based upon discussion with various industry groups, we find that they generally preferred that we target our publications at the equipment operators having the day-to-day responsibility for maintaining compliance. To serve this audience, handbooks were designed to be 16 to 20 pages in length, colorful, highly illustrated with lots of graphics and simple, easy-to-understand text that can be read in about 20 minutes. Besides providing information about controlling emissions from the source, the handbooks also tell readers about the harmful effects of air pollution and why they should be concerned about its control.

Development Process

Sources selected for the CAP are determined based upon a number of criteria: the excess emissions believed to be generated by the source; requests from districts and a determination that a particular rule is particularly difficult to understand and needs explanation. Once the category is selected, staff assigned to the project conduct research and work with the districts and industry groups to obtain their advice and critical review during the development process. A number of workshops are held.

Contacts made at this stage in the process help in marketing and distributing the publications once they are completed. Marketing is done through both the districts and industry groups.

Program Status

Since the program's inception in 1988, CAP staff have completed publications in the following categories:

Gasoline Vapor Recovery
Metal and Plastic Parts Coating (Includes Spanish language handbook)
Solvent Cleaning Operations
Cargo Tanks
Fuel Specifications
Hot Mix Asphalt

To date, over 40,000 handbooks have been distributed to users from companies such as Chevron USA, Shell Oil, Westinghouse, Unocal, General Dynamics, and Foster Farms. The handbooks have also received international distribution. Industry and government personnel from Canada, Germany, China, Mexico, the Netherlands and Finland have requested copies of these publications. Manuals have also been distributed to district and industry environmental managers.

Publications now under development include:

Stationary Internal Combustion Engines
Electrostatic Precipitators
Aerospace Coating Operations
Agricultural Burning

Case Study in Emission Reduction

One of the most important components of CAP is determining how successful the publications have been in helping industry comply with regulations. We hve received many letters from industry personnel thanking us for the publications and telling us how they have helped them stay in compliance. While this support is welcome, we felt it woiuld be even better to obtain concrete evidence that non-compliance rates are heading down as a result of this program. With the help of one gasoline distributor, we compared violation rates before and after the vapor recovery handbook was provided to industry personnel. Based on this comparison, we found that violations dropped four per month for the period under study to one per month. It should be noted that both management and employees participated in a training session using the handbooks as the text.

Conclusion and Future Direction

The publications appear to be meeting a need in improving inspector competence and industry understanding of regulations affecting their operations. The CAP will continue to produce high quality publications to meet identified needs. We anticipate that some of these publications may be prepared to help industry comply with newly adopted toxic air contaminant regulations and regulations governing emissions from the manufacture of consumer products such as household cleaners and personal care products.

GROUNDWATER EDUCATION ON WHEELS: A MOBILE ENVIRONMENTAL EDUCATION PROGRAM

Tara Ward
Ruth Kraut
Ecology Center of Ann Arbor
Ann Arbor, Michigan

Addressing a dilemma critical to our future, ours is a travelling program providing K-8 hands-on classes on groundwater and related topics. Unique educational materials produced include interactive displays, a videotape, and curriculum of hands-on activities. Presentation objectives are to demonstrate and make available these and other groundwater education materials, and to discuss program replication.

STRAND V: Cooperative Education Ventures

"I MAKE A DIFFERENCE" THE GLOBAL FOOD WEB A PUBLIC POLICY EDUCATION PROGRAM FOR YOUTH

Diane L. Davies
Eatonton, Georgia

This report session will highlight; a W.K. Kellogg Funded Project to the University of Georgia, Cooperative Extnesion Service. The 3 year interagency collaborative project focuses on the interelated global issues of human nutrition (world hunger), food supply and environment. Youth involved in the project peer teach others to expand the knowledge base.

UNIQUE SCHOOLYARD EXPERIENCES: HOW YOU CAN GET YOUR SCHOOL, NON-FORMAL INSTITUTIONS, PARENTS, AND STUDENTS WORKING TOGETHER

Karen Hollweg
Denver, Colorado

Martha McAfee
Arlington, Texas

David Wicks
Louisville, Kentucky

Imagine one teacher taking 30 excited, insect net-swinging upper-elementary students out around the school for a hands-on lesson in animal diversity, habitat, and human impact. "Mind boggling!", you say? Find out how 3 cities have developed programs worthy of National Science Foundation support, that involve trained adults and/or high schoolers to make environmental investigations manageable and memorable.

THE STATE OF THE ART IN ENVIRONMENTAL EDUCATION CENTERS AND NETWORKS

M. Jimmie Killingsworth, Panel Chair
Memphis State University
Memphis, Tennessee

Panel Summary: Three presenters will discuss the present actions and future potential of university-centered, but community-active environmental education networks. The panelists represent two model centers from a ten-year-old network, currently involving fourteen universities and two school cooperatives funded with seed money and follow-up support by the Tennessee Valley Authority (TVA) for the purposes of teacher training, regional service, program development, and research. The panelists will use their experiences to engage the audience in a discussion of how to realize the full potential of education networks in both schools and the community.

"The Public Power of Environmental Education Networks: Theory and Practice" by M. Jimmie Killingsworth, Memphis State University. This presentation will provide a general background for the discussion. It will suggest that networking has the potential to fill gaps in public environmental education left by the unavoidable incompleteness of classroom-based education, mass media, and the publication of scientific findings. The division of labor in our society has caused fragmentation of public information. Networking provides a non-authoritarian means of bringing together different perspectives on environmental issues for the benefit of students, teachers, citizen groups, and researchers.

"What Communicy Groups Want from Environmental Education Centers and How to Give It to Them" by Jacqueline S. Palmer, Memphis State University. This presentation will give an overview of the activities of the TVA-sponsored Center for Environmental and Energy Education at Memphis State. Since 1979, the Center has worked to raise environmental awareness through lecture series, workshops, newsletters, curriculum design, support for fledgling environmental groups, a resource center and a hotline. A recent survey of participants in center activities highlights preferred activities and suggests ways that other centers and networks might focus their work and maximize their potential.

"Cooperative Efforts at Networking in Environmental Education" by Terry Wilson, Western Kentucky University. This presentation will consider the TVA-sponsored network as a whole, providing descriptions of several cooperative efforts among the different centers. These ventures have involved curriculum development, workshop planning and implementation, regional outreach, field testing, and research. Evidence of the impact of these efforts on the Tennessee Valley region and beyond to national and international programs will be provided. In addition, research findings will be presented that help to explain some of the bonds that the network has created.

WATER UTILITIES AND TEACHERS: WORKING TOGETHER FOR A BETTER TOMORROW

Kimberly M. Knox
American Water Works Association
Denver, Colorado

Water Conservation can be a springboard for teaching students about their relationship with the environment. Free materials are available to help teachers integrate subjects and strengthen students' awareness of global issues. Intreguing hands-on activities will be shared, giving participants tools to create responsible future leaders.

ENVIRONMENTAL EDUCATION IN THE SUNSHINE: ACT III

Dr. David LaHart
Roy King
Cape Canaveral, Florida

This presentation explains how a handful of concerned citizens re-established EE as a major force in Florida. The Commissioner of Education is responsible for integrating EE into the formal education sector, the Office of the Governor promotes EE through adult and community education efforts and the Florida Advisory Council on Environmental Education works with state and local agencies to implement a variety of carefully targeted EE programs.

AN ENVIRONMENTAL EDUCATION MODEL FOR STATE SCENIC RIVER CONSERVATION

Lisa Bryce Lewis
Washington State Scenic Rivers Program
Seattle, Washington

A state scenic river environmental education program developed in Washington will be presented. The important role of public involvement, identification of goals and opportunities, and key environmental and recreational issues will be discussed. The community-based model illustrates methods for accomplishing state conservation goals through a mix of formal and nonformal education.

OUTDOOR LEARNING CENTER AND NATURE TRAILS: A VENTURE THROUGH COMMUNITY PARTNERSHIPS

Martha McAfee, PHD
Arlington Independent School District
Arlington, Texas

This session will present strategies for involving the community in delivering outdoor education programs to urban children. Participants will gain information on implementing such programs through community partnerships with the School District, Junior League, Parks Department, and the Phoenix Society.

ENVIRONMENTAL EDUCATION THROUGH GOVERNMENTAL AND BUSINESS COOPERATION

Kayton Nedza
Charlie Harvey
Outdoor Classroom
Wauchula, Florida

Abstract

The ways and means a small school system has developed an on-going comprehensive environmental education program grades K-8 and in some high school science classes. This program utilizes assets from both the county school district, county government, cities, state agencies, private corporate businesses and private individuals to conduct this program.

Environmental Education encompases a wide range of subjects. In a like manner the ways of achieving this education can encompass a diverse constituency of support.

Our program relies on the utilization of many different agencies and businesses to achieve success.

To fully understand how our program developed one must know a little about our location and demographics. Hardee County is located in south central Florida. The population is approximately 20,000 full time residents and several thousand migrant farm workers during the harvesting season. The economy is based on agriculture, although the near future holds the promise of growth in both the phosphate strip mining industry and recreational vehicle parks for winter residents.

In January of 1986 the Superintendent of schools and I had a discussion concerning the establishment of an environmental education program for Hardee County. A concept, similar to a program in neighboring DeSoto County, was selected. Following these early discussions, we asked the school administrators and teachers to comment on the proposed program.

At this point in time the county was experienceing rapid changes in land use. Several new recreational vehicle parks were being built. It was apparent that our county was going to be forced to grow. The coastal populations were overflowing into the center of the state, including Hardee County. The time seemed right for environmental education. But even with this concensus, weeks turned into months as every possible person, or so it seemed, was sought for input.

One day in February of 1987 a very important lesson was learned. After many months in which there seemed to be no movement or progress, I was about to decide the time was not yet right for an outdoor classroom. In the middle of delivering the last up-date that I intended to delivery, the Superintendent decided to recommend beginning the project. The lesson learned here is to never give up hope.

The school board accepted the proposal and soon the wheels were rolling and our multi-agency and business partnerships were being formed.

The school board provided the salaries and operating costs of the program. Unfortunately, it did not have a site that was suitable for the type of environmental education program we envisioned. The state had a park in the northern part of our county and we approached them with the idea of using it. They welcomed us with open arms, and a relationship of superior cooperation has developed.

In the ensuing three years many different mutually beneficial activities have been conducted. One of the most successfull was the jointly sponsored Earth Day 1990. The effect of this cooperation has been to virtually double or triple our staff on certain programs and activities at no cost to the school system.

Students in several grades study animals as their environmental education (Outdoor Classroom) field trip. Since animals cannot be counted on to appear just when you want them to, we use the zoo at the DeSoto county Outdoor Classroom. Our instructors do the teaching using the DeSoto County animals. In return, we have helped with several of their projects including producing instructional video tapes.

The Division of Forestry has supplied "Smokey the Bear". Local governments have co-operated with providing tours of their wastewater treatment facilities and sanitary landfills.

Through the grantsmanship of our district Curriculum Supervisor and Assistant Superintendent, we have helped operate several summer programs that have provided additional learning opportunities for students. These activities then led to a very important relationship with a major business in the area.

An educational foundation was created by the Hardee County School District. One of the primary sponsors was Agrico Phosphate Company which contributed $50,000 per year for five years, earmarked for environmental education.

Use of state matching funds expanded this money by nearly 40 percent. A high school environmental science class, and a summer marine science program are two courses that are the direct result of this cooperation. In addition, several different projects have been developed for our environmental education (Outdoor Classroom) program.

The cooperation with Agrico has led to field trips to their mining operation for every seventh grade student in the county, as part of their Outdoor Classroom field trip. The company's staff explains the mining process and steps taken to reduce the impact on the environment. Also reclamation of the land is explained. Weather equipment, video equipment and other important educational supplies have been purchased during the first year of this cooperative effort. Continued enhancement of educational opportunities for students through this commitment is foreseen.

Other plans include developing a fossil display, a photographic plant identification album of local plants, and a multi-media presentation about local history. All of these projects will use business, local government, and state government interaction.

In the coming years more interaction with businesses to develop advanced programs is anticipated. These will educate the community about the importance of preserving the Earth on which we live.

We strongly believe that business and inter-agency cooperation is the key to success in carrying out a strong environmental education program.

FWRS--A RESOURCE FOR ENVIRONMENTAL EDUCATORS IN THE '90S

Mary J. Nickum
Bethesda, Maryland

Abstract

The Fish and Wildlife Reference Service (FWRS) collects and makes available information produced by State and Federal fish and wildlife agencies. FWRS staff are prepared to assist educators in the development of useful material. This presentation will inform educators about this important source of information.

Environmental educators in the next decade will face several new challenges in the areas of fisheries and wildlife. Social concerns regarding big game hunting, economic aspects of disappearing wetlands, and the philosophical and genetic questions of replacement of wild stocks with hatchery produced fish are only a few. Environmental educators are charged with motivating young people to conserve, yet use and manage natural resources. Natural resources, such as air, water and land, must be used. It is not a question, in most cases, whether or not a resource will be used, but what constitutes wise use of that resource.

Teaching materials developed with the goal of teaching wise use of natural resources must have a solid scientific base. Information based on opinions, second-hand data, and general statements, is often biased and not supportable. Information without a scientific base may be geared to elicit an emotional response. Emotionalism and conservation are a dangerous combination. Good scientific information provides results based on carefully controlled studies and records of past successes and failures of resource management. Wise use decisions based on scientific information brings humans and the resource into balance.

It is important that scientific information be up-to-date. We are constantly learning about the world around us. We are seeing now how our past activities are affecting our environment. Such factors as acid rain, diminished ozone layer, and conservation of genetic resources were not concerns, nor even considered possibilities, 30 years ago. Old information about land use practices may not consider problems of wetland loss for waterfowl, forest loss for wildlife, and more recently, humans. Young people must have access to results of current studies and what is being currently studied.

Environmental educators need access to information that is scientifically developed and up-to-date. And, it must be readily accessible. The Fish and Wildlife Reference Service is an information resource that meets all three criteria.

The Fish and Wildlife Reference Service (FWRS) collects, indexes, stores, and makes available the research reports developed by State fish and wildlife agencies, Cooperative Fishery and Wildlife Research Units, and Endangered Species Recovery Teams.

FWRS offers several services. All services are available to all users:

- Searches of the FWRS databases
- Document distribution
- Fish and Wildlife Thesaurus
- Quarterly Newsletter
- Education file
- Assistance in developing educational materials
- Referral to other resources

Searches of the FWRS database. FWRS maintains two databases. One database consists of citations to all fish and wildlife documents in the collection. The second database is a listing of current studies being performed in the States that are funded by the U.S. Fish and Wildlife Service Division of Federal Aid. The Reference Service conducts literature searches of the FWRS database, producing bibliographies for requestors. Computer literature searches provide a list of documents or projects that deal with a specific technical or biological questions. The FWRS database includes approximately 20,000 records of reports, published papers, technical publications, theses, and recovery plans.

Document Distribution. The FWRS receives documents and reports from the following Federal, State, and private sources:

- Federal Aid in Fish and Wildlife Restoration Documents
- Anadromous Sport Fish Conservation Program Documents
- Endangered Species Grants Program Recovery Plans
- Cooperative Fishery and Wildlife Research Units Theses and reports
- State fish and wildlife agency reports
- Division of Federal Aid current research reports and general surveys
- Boating access articles and other materials
- Education materials developed by State and Federal agencies regarding fish and wildlife

FWRS fills document requests in either photocopy or microfiche format. Requests can be mailed or phoned to the Reference Service. The maximum turn-around time for information is 5 days. Requests are filled using copies made from original documents or microfiche masters.

Fish and Wildlife Thesaurus. The FWRS Thesaurus lists the terms that constitute the FWRS vocabulary. The Thesaurus consists of three parts:

- A thesaurus of terms--an alphabetical listing of organisms, individual organs and systems, inanimate objects, and procedures and concepts selected from scientific, technical, and management vocabularies.
- The classified index--an hierarchical listing of the FWRS vocabulary. The location of a given preferred term in the Index is set by its classified index number, an eight digit code unique to the term.
- Geographic descriptors--used to identify the locales in which an investigation has been conducted.

Quarterly Newsletter. The FWRS publishes a quarterly newsletter. The newsletter is a six-page publication mailed to about 9,000 users included on the FWRS mailing list. The newsletter is free and new users will be added to the mailing list at their request. Newsletters cover specific subjects, listing FWRS document holdings on the subject and other information helpful to users.

Education file. This file is a collection of education related material developed by State fish and wildlife agencies. The material exists in various formats including lesson plans, brochures, posters, and video tapes. The file currently contains material provided by 25 states. Material is available to on-site visitors to browse. Multiple copies can be obtained directly from producing states.

Assistance in developing education material. The Reference Service is a full-service information center staffed by fish and wildlife biologists with education backgrounds. FWRS staff are prepared to assist educators in the interpretation and application of scientific data to educational material development.

Referral to other sources. If FWRS is not able to provide information on a specific question or if other sources may have additional information, the user will be referred to that source. FWRS has developed a comprehensive list of government, university, and private libraries and information sources that have agreed to accept referrals.

Educators need access to solid scientific information to provide credible material to educate future natural resource users and managers. Materials in the FWRS are reports of research, surveys, and recovery plans accomplished by biologists. FWRS staff not only make these materials available, they also have direct access to the biologists who did the studies. This partnership between FWRS staff and the research biologists provides the environmental educator with a powerful information source.

FWRS staff are prepared to assist educators. The FWRS will join with an educator or group of educators, in a cooperative venture in education . Such ventures could include educators meeting with FWRS staff, one-on-one, to create a teacher's manual and lesson plan, in-service workshops for groups of educators with research biologists, long-distance telephone discussions regarding materials and use of information, and in some cases, FWRS staff member visiting a regional or state environmental educators meeting. These cooperative ventures can be tailored to the needs of requesting educators.

In summary, FWRS provides direct, timely access to information not available from other sources. FWRS will provide documents, literature searches, and will help in the adaptation of FWRS material to educational uses. There is a fee charged for some services. Contact the FWRS by phone or mail for a cost summary. Services are accessible by mail, by toll-free telephone, and in-person visit. To mail a request or visit, the FWRS is located at 5430 Grosvenor Lane, Suite 110, Bethesda, MD 20814. Please use our toll-free number, 1-800-582-3421 to call, inside Maryland use 301-492-6403.

JUNIOR HIGH SCHOOL CENTER FOR ENVIRONMENTAL STUDIES: AN ENVIRONMENTAL PROGRAM GROWS IN BROOKLYN

Thomas Oppecker
Prospect Park Environmental Center
Brooklyn, New York

A multi-year, multi-grade environmental education program of an urban environmental center collaborating with a public junior high school is described. Funding, adminstration, staff, facilities, curriculum development, recruitment of students, parental/community involvement, and impact on the educational community are considered as a case study for development of similar programs elsewhere.

STRATEGIES FOR DEVELOPING ENVIRONMENTAL STUDY AREAS: COOPERATIVE OPPORTUNITIES FOR NATURAL RESOURCE AGENCIES AND SCHOOL DISTRICTS

Nancy C. Ratner
Alaska Department of Fish and Game
Douglas, Alaska

The purpose of this interactive session will be to present and discuss strategies for developing environmental study areas near schools including interagency cooperation, trail design, and curriculum infusion. An approach used in Juneau, Alaska will be shared.

USING PRESENT RESOURCES TO CREATE A NEW ENVIRONMENTAL EDUCATION PROGRAM

JoAnn Roberts
Sue Johns
CHESPAX EE Program
Huntingtown, Maryland

Learn of this unique system which utilizes county, state, and private agencies in a coordinated environmental education program. See how a cooperative effort has allowed in-school activities and field trips to provide a strong environmental program without excessive staffing of resources.

FUNDING SOURCES FOR ENVIRONMENTAL EDUCATION IN URBAN SETTINGS

Joyce B. Taylor
Dade County Public Schools
Miami, Florida

A compendium of environmental education projects will be presented which focus on field studies as the core curriculum for high school marine biology and ecology courses. A community partnership/grant funding model will represent a variety of funding sources including federal/state grants along with private/corporate funding.

HEALTH EDUCATION: LINKAGES FOR ENVIRONMENTAL EDUCATORS

Lynn M. Waishwell, PHD
Thomas Bierma, PHD
Illinois State University
Normal, Illinois

Health educators are professionals who use educational strategies to facilitate health behavior change. Environmental education in the 90s will emphasize behavior change objectives. Linkages between environmental and health educators will help both to reach goals of the next decade. This paper presents the foundations for such a cooperative education venture.

STATE ENVIRONMENTAL EDUCATION ASSOCIATION RELATIONSHIPS WITH NAAEE

David Wicks
Ann Seppenfield
Kentucky Association for Environmental Education
Louisville, Kentucky

Alan Soward
Sally Evans
Association for Environmental Education
Texas

A discussion of relationships between state environmental education associations and NAAEE. Presently only two (2) state associations are affiliate members. This session will explore the possibilities for a more substantial relationship from a state perspective. We believe that stronger ties between the state and the national association will benefit both local and federal policies and practices.

YOUR SEWER DISTRICT--A COMMUNITY ENVIRONMENTAL RESOURCE

Jan Wolanin
Louisville, Kentucky

Abstract

Want to teach water quality issues effectively? Use your sewer district as a community resource! Learn about the Louisville and Jefferson County Metropolitan Sewer District's School Partnership Program. An annual four-day Environmental Science Seminar Series instructs teachers about wastewater treatment, the regulation of industrial wastes and hazardous materials, streamwater quality monitoring and stormwater drainage and flood protection.

During the summer of 1988, the Louisville and Jefferson County Metropolitan Sewer District (MSD) hired me to help it expand its school outreach program. As local science teacher, I thought that all MSD did was treat wastewater. Did I have a lot to learn!

I spent the first half of the summer learning about wastewater treatment and three other MSD programs about which my project manager thought teachers would be interested -- industrial waste and hazardous materials, stream water quality, and stormwater drainage and flood protection. (Louisville is located on the Ohio River.) I learned by meeting with key program personnel, touring various MSD facilities, and reading everything I could get my hands on.

Then it was time to plan a four-day Environmental Science Seminar Series in the fall, and solicit participants from the local public, private, and parochial schools. Twelve middle and high school science teachers were selected to participate.

The first seminar focused on wastewater treatment. A tour of the newly constructed West County Wastewater Treatment Plant followed a discussion of basic treatment principles and a look at the history of water and wastewater treatment in Jefferson County. After watching a videotape about an out-of--compliance package plant acquired by MSD, participants were bused to the plant to observe subsequent improvements. Back at the West County Plant, the day concluded with laboratory demonstrations including the settling of a beaker of plant influent and the observation of slides of microorganisms feeding on activated sludge.

The next seminar was held at the Morris Forman Wastewater Treatment Plant, which processes most of Louisville's sewage. A tour of the 105-mgd plant began the day, followed by a lecture on MSD's industrial wastewater pretreatment program. This program requires major local industries to remove toxic sub-stances from wastewater before discharging it into the sewer system.

After a brown-bag lunch, teachers watched a slide show summarizing Louisville's and Jefferson County's Hazardous Materials Ordinance. This law requires businesses with certain amounts of hazardous materials on site to submit a Hazardous Material Spill Prevention Control Plan for review by the Fire Department and MSD. In addition to implementing plans and educating their employees about them, businesses are responsible for reporting spills to an emergency number. MSD responds to many of the reported spills.

Next on the teachers' agenda was a tour of MSD's major laboratories. Participants were divided into small groups and rotated through metals, instru-mentation, industrial waste, and quality control labs. The day ended with an explanation of MSD's plant effluent biomonitoring program, which studies the survival rate of water fleas and fathead minnows in various dilutions of plant effluent.

Water quality was the theme of the third seminar. Topics included the Physical and Chemical Stream Monitoring Program, a joint project of MSD and the U.S. Geological Survey; and MSD's Biological Stream Monitoring Program, initially funded with a Virginia Environmental Endowment Grant. Both programs are designed to determine the effects of different pollution sources on the streams of Louisville and Jefferson County.

Participants learned more about these monitoring programs by taking a trip to one of MSD's stream sampling sites. Technicians demonstrated techniques of sampling and measuring stream flow in addition to collecting previously planted artificial substrates which had been colonized by various macroinvertebrates. Back at the West County lab, the teachers watched the removal, sorting, and identification of the specimens.

The last seminar concentrated on drainage and stormwater management. A bus tour of a local watershed included stops at a drainage channel, retention basin, pumping station, and an earthen levee and floodwall bordering the Ohio River. A luncheon for teachers and MSD officials concluded the Seminar Series. Following a seminar evaluation, each teacher received a certificate of participation.

The teachers were very pleased with the seminar series and recommended its annual repetition. They shared ways they planned to incorporate what they learned into their lesson plans and suggested other ways MSD could contribute to education. One idea was the construction of a watershed and drainage exhibit at Louisville's Museum of History and Science.

Since the initial Seminar Series of 1988, MSD has expanded its outreach to educators by:

- Sponsoring a 1989 Environmental Science Seminar Series.
- Presentations at conferences of the Kentucky Association for Environmental Education and the Kentucky Association for Progress in Science (recently renamed the Kentucky Science Teachers Association).
- Participating in the annual Children's Environmental Festival at the Louisville Zoo.
- Attending the 1989 Governor's Conference on the Environment.
- Participating in a public safety and health program at a magnet high school in the Jefferson County Public School System.
- Committing as a major sponsor of Louisville's celebration of the 20th Anniversary of Earth Day.
- Entering an environmental education sponsorship with an inner-city elementary science magnet school in the Jefferson County Public School System.
- Presentation on engineering and education at the 1990 Kentucky Society of Professional Engineers (KSPE) State Conference held in April.

Each project seems to lead to another -- it's been very exciting to be part of MSD's growing partnership with the schools of Louisville and Jefferson County.

For more information about MSD's Environmental Science Project, contact:

Mike Carter, Project Manager
Engineering Division
Louisville and Jefferson County
Metropolitan Sewer District
400 South Sixth Street
Louisville, Kentucky 40202-2397
(502) 587-0591

Jan Wolanin is a full-time third through sixth grade science teacher at St.Francis School in Goshen, Kentucky, and a part-time Environmental Science Consultant for MSD.

TROPICAL RAINFOREST EDUCATION: A STATE-WIDE EFFORT

Peggy Millett Zemach
Denver Museum of Natural History

Rich Larson
Colorado Division of Wildlife
Denver, Colorado

The Smithsonian Institution's travelling exhibit, "Tropical Rainforests: A Disappearing Treasure" will be at the Denver Museum of Natural History in September 1991. The museum is collaborating with several city and state agencies and other museums in developing educational programs for school students, their teachers, and the general public. This session will address how this partnership formed and what specific programs and events are being planned.

STRAND VI: International Education Programs

ENVIRONMENTAL PLANNING AND MANAGEMENT IN MICRONESIA

Dr. John M. Baldwin
Ms. Maradel Gale, J.D.
University of Oregon
Eugene, Oregon

The University of Oregon Micronesia Program is an educational exchange program developed between the University of Oregon Department of Planning, Public Policy and Management and several governmental agencies and academic institutions in the Federated States of Micronesia. This paper summarizes the exchange program, and discusses the teaching of a national resource planning course to government officials in Pohnpei.

GLOBAL RIVERS ENVIRONMENTAL EDUCATION NETWORK (GREEN)

Almut Beringer
James Bull
Mare Cromwell
Martha Monroe
William B. Stapp
Arjen Wals
University of Michigan
Ann Arbor, Michigan

Abstract

The Global Rivers Environmental Education Network (GREEN) is designed to 1) engage students in water monitoring activities, 2) improve the quality of education, 3) involve students in problem-solving, 4) foster cross-cultural sensitivity through increased international communication, and 5) promote global cooperation. Networking among GREEN participants in 28 nations is done via interactive computer communication systems, newsletters, and sister school projects.

In recent years, environmental issues have moved to the forefront of public policy agendas in nations around the world. Pollutants contaminating water, soil, and air along with poor land management practices coincide with the stress of rising populations in most regions of the globe. Mounting concern about global environmental trends, especially the desecration of valuable water sources in all regions, has triggered a renewed interest and strong need for innovative and effective environmental education programs.

The Global Rivers Environmental Education Network (GREEN) is an expanding international network of students, teachers, environmental professionals, and other interested persons who seek to study and improve the water quality in their regions. By linking schools around the globe with newsletters, a pilot computer conference, sister watersheds and other forums, GREEN invites students to learn about and become involved in complex, real-world problem-solving that extends across political and cultural boundaries.

Rivers were selected as an environmental forum for international networking within the GREEN Project for a number of reasons. Many rivers bound nations and separate political systems. They are also a rich economic resource, providing an important means of livelihood for many communities. In the world today, 85 percent of all people live along rivers, lakes and oceans. The industrial world continues to use rivers and oceans for disposal of wastes, hereby threatening various life forms and ecosystems. In the developing world, 75 percent of the rural population lack access to reasonably safe water, and one of every four hospital beds is occupied with a patient suffering from a water-borne disease. In some African and Asian countries, 90 percent of children's deaths could be prevented by better water supply systems, environmental sanitation and sewage disposal.

GREEN focuses on these critical water issues by involving students and teachers with professionals and concerned citizens in the exploration and re-evaluation of how water is used as a resource. Participants in the GREEN Project receive an experiential approach to science education by learning to monitor the water quality of their local river; by taking actions to improve the water quality, hereby resolving real-world issues; and by sharing their data, concerns and activities with students across the globe.

A river study can be an interdisciplinary program when the scientific water quality monitoring is enriched with historical, sociological and geographical investigations of the local land and land-use systems. With this approach, students can understand the complex cause-effect links that have created local problems. As an interdisciplinary program, GREEN can be infused into the natural and social sciences, geography and the humanities.

By inviting schools to incorporate water studies into their curricula, GREEN encourages students to research and pursue solutions to problems of natural resource management. GREEN participants are asked to go beyond the discussion of solutions by developing action-taking strategies. By taking actions to improve water quality, students learn how they can become effective change agents. The realization that their work is part of an international effort to improve water quality will empower them to believe in themselves as they develop a stewardship attitude toward the natural environment which is so integral to survival.

The concept of GREEN originated as a water quality monitoring project with high school students in the Great Lakes region. The program has evolved to include watershed based programs involving thousands of students in not only the United States, but also in nations throughout Asia, Africa, Latin America and Europe. Cureently, educators in 19 nations are initiating water study programs and are developing strategies for participating in the GREEN Project.

For further information, or to become a participant in the GREEN Project, please contact:

The GREEN Project
School of Natural Resources
University of Michigan
Ann Arbor, Michigan 48109-1115, USA
(313) 764-1410

THE ENVIRONMENT INTERPRETATION OF THE LATIN AMERICAN WILDLAND AREAS AND ITS 90 YEARS CHALLENGE

Angel Cabeza
Santiago, Chile

Cesar Ormazabal
New Haven, Conneticut

This paper gives a comparative general vision of what kind of work has been done in the Lating American protected areas in the last ten years. The main problems, needs and what should be the principal task of the next ten years will be discussed.

WHAT'S THE TROPICAL RAIN FOREST REALLY LIKE? THE RESULTS OF TWENTY TEACHERS' FIELD EXPERIENCE

Michael R. Cohen
Linda Furuness
Indiana University-Purdue University

David Fishel
Indianapolis Zoo
Indianapolis, Indiana

Abstract

Over the 1989 winter holidays a group of twenty primary and secondary school teachers explored a tropical rain forest as part of a curriculum development project. This presentation looks at how the experience changed their conceptions of the rain forest ecology, its destruction as well as the unanticipated effects on their concepts of teaching.

The research as described in this paper is three-fold: 1) it describes how emersion in an unfamiliar environment and culture affected teacher learning, both cognitive and affective; 2) it describes some of the significant experiences which affected teachers functioning in the dual role of learner and teacher; and 3) it describes how the combination of these elements changed the teachers' images of themselves and their values.

The uniqueness of this project is important, not because it included a trip to a foreign country, but because it studied experienced teachers placed in the role of novice learners. Their reflections on how they experienced the trip from a learner's standpoint are particularly noteworthy. This paper does not attempt to be comprehensive nor to assign values to these factors. However, it does try to elucidate how these factors had an impact upon individuals in particular experiences and the significance of these factors on learning.

This project was jointly sponsored by IUPUI (Indiana University-Purdue University-Indianapolis) and the Indianapolis Zoo. Twenty teachers in addition to two faculty persons from IUPUI and one educator from the zoo participated. The teachers, which included elementary, junior high/middle school and high school persons, came from diverse backgrounds and had a wide variety of experiences. The excursion to Costa Rica began the day after Christmas, 1989, and entailed four days in a tropical rain forest, two days on an active volcano, and one day in the capital city of San Jose. In addition, the project included five Saturday workshops prior to the trip and five additional workshops after the trip preparing curriculum and presentation materials, and participating in conservation events.

Five Significant Experiences

Sensory and Counterintuitive Experiences: Although the teachers had studied about the kinds of plants, animals, and weather they would be encountering, actually experiencing these was another matter. For example, although the teachers knew that the ground would be muddy and the humidity high, hiking through ten or more centimeters of very squishy mud (sometimes it was more like sliding) and continually wiping off lenses, both spectacle and camera, were sensory perceptions which became real only when experienced. These sensory experiences were especially heightened because they were so different from experiences which the teachers had had living in the midwest.

Another kind of experience which the teachers struggled with were counterintuitive happenings. For example, in Indiana the constellation Orion is more or less upright in its position in the sky. However, near the equator, Orion is horizontal. In some respects observing Orion in this unexpected position was like seeing the sun rise in the north rather than the east. It just did not seem to make sense. This phenomenon did not fit in with expectations or previous experiences.

These experiences were important because they reinforced the significance of learning settings which are different from the norm. The unique learning settings sharpened the sensory perceptions and attention of the participants. Of course, the teachers observed many phenomena which were expected, or at least hoped for, such as tropical flowers, bromeliads, tree ferns, sloth, monkeys, toucans, and many other fascinating plants and animals. But observations such as "Orion on its side" held particular significance because they were not expected.

The Naming Dilemma: The species of plants and animals which the teachers saw were numerous and very different from Hoosier flora and fauna. This led to an interesting philosophical dilemma for the teachers. One of the teachers who taught a summer nature and environmental education program was very knowledgeable about the trees and animals found in an Indiana woods. However, he indicated that walking through a forested area and not knowing the names of all of the species was rather disconcerting for him. The experience reminded him of what his students must feel the first time that he takes them out into a woods.

This comment evoked a discussion among the group concerning the importance of knowing the names of all of the plants and animals. A number of the teachers felt that it was important for their students to be able to name what they saw. Others said that being able to observe and record observations was more important than being able to name everything.

The teachers soon came to realize that it would be impossible for them to be able to name all of the plants and animals, expecially those which did not look like or have any association with their previous experiences. The teachers began creating their own names for the plants and animals such as "bullet ant" for a large ant with a particularly painful sting and "butterflies with transparent wings" and "scarlet tananger in reverse." These kinds of names also helped the teachers to identify the particular species at a later time when they had access to reference books.

The high school teachers in particular struggled greatly with the naming problem. Their experience in the rain forest had been one in which they could communicate quite effectively without naming species, but when they returned home, they would be expected to require their students to do the opposite--know the names of things.

Personal interactions: A third important learning centered around the interaction which the teachers had with the people of Costa Rica (called ticos). Friendships which developed between the teachers and the ticos ranged from the bus driver who transported them over rutted dirt roads and narrow rickety bridges (or fords when bridges were not deemed necessary), to interpretors who were well educated, knowledgable young adults, to the families and children whom they met on the trip. And, although their direct interaction was for only a short period of time, ongoing friendships were established with some of the ticos.

For many of the teachers, the interaction with the Costa Rican people was the most significant learning experience that occurred. It was more than learning about the ticos or learning from them. It was a shared, even an emotional, kind of learning which enabled the participants to understand the human aspect of the rain forest problem. The people directly interacting with the rain forest were no longer just faces in pictures or names on a page, but warm, caring friends who were living simple self-sustaining lives. As a result, the teachers' concepts of the forest seem not to center on the flora and fauna, although these were an important part, but on the relationship of the ticos with their environment.

Adventure and Self-confidence: A fourth important aspect of the trip was the teachers' pervasive attitude of adventure and self-confidence. This became evident in many ways, but was most noticeable when they were traveling on the bus which always took twice as long as was expected. This was so because the teachers frequently saw something of interest and had the bus driver stop so that they could get out and observe and take pictures. It did not seem to matter how silly or ridiculous the teachers appeared to passing motorists and local residents. Their attitude toward learning--experiencing something new--was so overwhelming that it overcame any inhibitions and reserve they had about themselves. Teachers do not readily make fools of themselves, and yet here they were, willing to be considered at least peculiar for the sake of learning something new. Had they been less sure of themselves, less willing to be adventurous, less willing to be different, they would certainly not have learned nearly as much as they did.

Understanding as a Complex Phenomenon: During the pre-trip workshops the teachers had studied the complexity of the rain forest biome. They understood the grave problems facing the world's rain forests. Most of the persons in the group went to the rain forest to try to find some answers as to why these things were happening and what could be done to stop the destruction. The teachers felt they could then share that understanding with their students.

The teachers did came away from the experience with some of their questions answered. They saw the immense diversity and beauty of the rain forest. They saw the ticos making simple livings on their cleared land. They saw people desirous of keeping their natural resources, but at the same time wanting a better life style--maybe something that approaches that of the Americans! They met caring families and delightful children who appeared to live uncomplicated lives in harmony with the rain forest. What the teachers found were no simple answers, not even complex answers.

In most class studies, teachers and students are concerned about finding the right answers or drawing conclusions about what has been studied. And, our own lives, by and large, are based on drawing conclusions and finding correct answers to problems. This process did not happen for many of those who participated in the rain forest trip. There were questions and concerns from which insights were gained. The teachers understood the diversity and the deforestation problems much better after having observed them. But, few of them would be willing to draw conclusions about what they found. The amazing aspect of this is that they feel comfortable not being able to do that. Drawing definitive conclusions about what they had learned seemed really quite impossible, and unimportant. Sharing the insights and values which they had gained appeared to be of much greater worth.

Conclusion

As a result of these experiences, a number of the teachers have re-evaluated how they are teaching in their classrooms and made a commitment to change their teaching methodologies. Others are re-examining their own personal values and priorities. What they learned in experiencing a different environment and culture seemed to have had a strong impact upon their views of themselves as individuals as well as teachers.

THE GREENWAY EXPERIENCE

Carl Crookham
Denver, Colorado

This internationally recognized program features educationally-at-risk teenagers rekindling their interest in graduating, by becoming environmental tour guides. Spanning twenty years, teen guides have conducted day-long field trips for over 35,000 children and adults.

POSSIBILITIES FOR THE INTERNATIONAL DISSEMINATION OF A WORLD-WIDE ECOLOGICAL HYMN. DESCRIPTIVE ESSAY ABOUT THIS MEANS OF ENVIRONMENTAL COMMUNICATION.

Conrado Ruiz Hernandez[1]
Mexico, D.F, Mexico

Abstract

Through our project's initiative, the pamphlet-score of the Hymn to the Ecosystem was published in 1986. In preliminary consultations with UNESCO and the United Nations Environment Programme officials, an interest was shown in the possibility of the hymn's being translated into other languages. The National Autonomous University of Mexico collaborated in these versions: Arabic, Chinese, English, French, German, modern Greek, Hebrew, Italian, Japanese, Portuguese, Russian and Swedish.

Introduction

The Conservation and Environmental Improvement Project (CyMA) of the Iztacala National School of Professional Studies, entity of the National Autonomous University of Mexico (UNAM), in the course of its investigations in the area of environmental education, has developed a strategy for environmental education using recorded music and/or musical score as a means of mass communication. The creation and proposal for the World-Wide Ecological Hymn falls within such strategy.

This song, whose original title is Hymn to the Ecosystem of as well "Love Live for Ever" (Ama la Vida!), grew out of an on- going interdisciplinary project initiated in November, 1983, Its authors, a biologist (Conrado Ruiz) and a musician (Omar Ortiz), sought to integrate a formal ecological discourse with a musical expression which reinforces the formative and educational purpose of the work,, for its use in schools. It was first presented in a celebration of the World Environment Day on June 5, 1985, and was interpreted by the UNAM Choir, under the direction of Jose' Luis Gonza'lez. The pamphlet-score of the Hymn to the Ecosystem was published in 1986. (1,2)

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[1] * The designer of the overall proposal and author of the Hymn's text. Presently the head of the research area in environmental education for the CyMA Project.

Didactical Proposal

The educative proposal has the following objectives:

1) To provide a didactical resource that is capable of being incorporated into a school's musical program, which contributes to the formation of favorable attitudes and behavior on the part of primary school children and stimulates their participation in the conservatin of natural resources and in the imporvement of the quality of life.

2) To present an alternative strategy for environmental education employing esthetic activities (in this instance music), by means of an interdisciplinary curricular model which relates such activities to the respective natural science and social science programs.

This hymn-in its formulation as a didactical proposal, with glossary, pedagogical suggestions and score-was presented to the mexican educational authorities in January, 1987.(3)

Elements Of The Proposal

I. Text and score (here only lyrics):

HYMN TO THE ECOSYSTEM

ORIGINAL TITLE: LOVE LIFE FOR EVER!

Defend the ecosystem with its flora and with its fauna, remember that you share, with other forms of life, with other living creatures, this planet, our planet, the irreplaceable planet Earth.

Whenever you harm life you are also herming yourself. The sun, the air, and the soil, are the sources that support your life, keep this always in your mind. Love life for ever! and let joy survive through the passing time.

II. Pedagogical suggestions

For the purpose of its didactical application, the following suggestions are provided for the teacher:

1) It is fundamental that along with its musical resolution, the implied meaning of the Hymn's text be explained.

2) It is very important that the natural science and social science teachers participate in the explaination of these concepts.

3) The teacher, aided by the suggestion in point 2, should make the explaination and the presentation of such concepts accessible to the students by citing examples related to the social and ecological ambiance of the school.

III. Glossary

Including seventeen concepts, as follows: Air, Biosphere, Community, Ecology, Ecological Niche, Ecosystem, Enuironment, Fauna, Flora, Habitat, Life Forms, Natural Resource, Pollution, Soil, Specie, Sun and Water.

Promotion In "Ad Hoc" International Educational Organizations

The United Nations Environment Programme (UNEP) carried out a limited disseminaiton of the Hymn through the Environmental Training Network for Latin America and the Caribbean. The promotion carried out by the UNEP resulted in a small but significant number of requests for copies, as well as comments and evaluations.

For the purpose of determining the nature of this musical work, presented as a didactical proposal, our group researched the area of environmental communication (particularly with respect to the which has been denominated as "green songs"). This research permitted us to establish that the Hymn provides a type of communicative material which is unique on a world-wide level.

In preliminary consultations with UNESCO officials, an interest was shown in the possibility of the Hymn's being translated into other languages. After a linguistic and musical evaluation, it was concluded that this would be a difficult but reasonably feasible project. The National Autonomous University of Mexico, thourgh its Foreign Language Teaching Center (CELE) -an institution of the Coordinator of cultural Dissemination-and the Academic Extension Division of the Iztacala National School of Professional Studies, collaborated in literary translation and the musical adaptation into these languages: German, Arabic, Chinese, French, modern Greek, Hebrew, English, Italian, Japanese, Portuguese, Russian and Swedish. The proposal, which consists of a communications package, includes the original Spanish language version as well as the English and French versions. It was sent to the UNESCO central offices in Paris for review.(4)

Conclusions

Since this material lends itself to incorporation in school music programs, and its literary and musical adaptability has been shown for a considerable number of languages, its promotion as a world-wide ecological hymn seems viable. Although its practical utilization would be limited to educational purposes, it is important to mention that hymns, in general, sociologically respond to the goal of reinforcing civic and moral behavior.

Notes And References

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2. Tape recording (cassette): 1986. Primer concurso Nacional de la Cancion de Tema Ambiental. Las diez canciones finalistas y el himno Ama la Vida!. Mexico, D.F. Asociacion Mexicana de Investigadores de la Contaminacion Ambiental (AMICA, A.C.)

3. Ruiz, C., 1988. El himno al ecosistema. Una propuesta para el programa de musica escolar de la Secretaria de Educacion Publica. In: Memoria (proceedings) del I Coloquio de Ecologia y Educacion Ambiental en Mexico. Concepciones, perspectivas y experiencias. Efectuado en la Ciudad de Mexico del 24 al 27 de marzo de 1987. Secretaria de Desarrollo Urbano y Ecologia y la Universidad Nacional Autonoma de Mexico. pp. 211-219. Mexico, D.F. Talleres Graficos de la Nacion.

4. Ruiz, C., 1989. Hymn to the Ecosystem. Universal message and song. In: Memoria (proceedings) del Primer simposio Internacional de Quimica Ambiental y III Reunion de Investigadores Universitarios en Contaminacion Ambiental. Efectuado en la Ciudad de Mexico los dias 27 y 28 de noviembre de 1989. Facultades de Quimica y Medicina e Instituto de Geografia de la Universidad Nacional Autonoma de Mexico. pp. 87-88, Mexico, D.F. Universidad Nacional Autonoma de Mexico.

CROSS CULTURAL PROGRAMS ADDRESSING ENVIRONMENTAL ISSUES IN THE SEA OF CORTEZ

Doug Hulmes
Prescott College
Prescott, Arizona

Lorayne Meltzer
Joe Barnes
Northeastern University
LaPez, Mexico

The Sea of Cortez is one of the most biologically and culturally diverse areas in the world. This presentation will examine two of the Prescott College's interdisciplinary field programs that focus on ecological and cultural studies and their relationship to the 1st and 3rd world interface of the U.S. and Mexico.

STRATEGIES FOR ENVIRONMENTAL EDUCATION IN LATIN AMERICA AND THE CARIBBEAN

Augusto Medina
World Wildlife Fund
Washington, DC

Find out about the innovative approaches that environmental educators in Latin America and the Caribbean are using and examine the constraints they must overcome if they are to effectively address environmental problems in the '90s. This session will present the results of World Wildlife Fund's survey to determine the status and needs of environmental education in the region.

GARBAGE THAT IS NOT GARBAGE: ENVIRONMENTAL EDUCATION IN BRAZIL

Adelia M. Peters
Bowling Green State University
Bowling Green, Ohio

Community leaders in southeastern Brazil, in Parana State, take pride in their active, progressive programs in environmental education. A city-wide campaign is underway in Curitiba, the capitol, to teach people the value of recycling. Based on information gathered in late 1989 the slide presentation provides information about this community's comprehensive public and private efforts.

DEVELOPING ENVIRONMENTAL EDUCATION MATERIALS IN THE GALAPAGOS

Gay Ver Steeg
Charles Darwin Research Station
Porterville, California

The Charles Darwin Research Station supports the development of environmental education materials for use in the schools of the Galapagos Islands. Two projects will be compared and evaluated using a slide presentation. A social science workbook with text, maps, charts, questions, puzzles, art projects, etc. This book is presently being classroom tested in the Galapagos.

A PLANNING INSTITUTE FOR TEACHERS: ENVIRONMENT AND DEVELOPMENT

Merebeth Switzer
Kingston, Ontario, Canada

For twelve days in August, 1990, twenty educators met to evaluate an Institute which would bring together environment and development issues, and relate to the global education movement in Canada. They visited Costa Rica to experience development and to evaluate the value of interactions between Third World researchers and teachers.

ENVIRONMENTAL EDUCATION IN THE HIMALAYAN KINGDOM OF BHUTAN

Terry Wilson
Western Kentucky University

Emily Mead
World Wildlife Fund
Bowling Green, Kentucky

Environmental education programs in the small nation of Bhutan are currently being developed through the cooperative effort of the World Wildlife Fund and the Bhutanese Department of Education. This presentation will provide an overview of these programs, along with an introduction to the environment issues facing this developing Himelayan country.

THE INDO-U.S. CHILDREN'S ENVIRONMENTAL EDUCATION TELEVISION PROJECT--THE PRODUCTS OF PHASE ONE

Kartikeya V. Sarabhai
Centre for Environment Education
Ahmedabad, India

For three years India's Centre for Environment Education and the SUNY College of Environmental Science and Forestry have been engaged in Phase One of a project to develop a video-based environmental education program for the children of India. During this experimental phase ideas were tested and format decisions evolved. Now the project is moving into Phase Two, the production phase, in which a series of 13 instructional video modules will be finished and employed. This presentation will showcase the findings and products of the first phase of the CEETV Project.

STRAND VII: Promoting EE Programs

A PROFESSIONAL APPROACH TO PUBLIC RELATIONS AND MARKETING

Marc Breslav
Garrison, New York

A practical demonstration of unusual public relations and marketing approaches by a professional in these fields. Case studies from environmental organizations illustrate key concepts. Using a challenge a participant faces, the group then begins to develop a plan to solve that challange.

INTERPRETATION AND ENVIRONMENT EDUCATION'S PLAN FOR THE PROTECTED WILDLANDS AREAS OF CHILE

Angel Cabeza
Santiago, Chile

The progress made by environment education in the last 20 years and the development of protected wildland areas are analized in this paper. Special attention is given to problems, errors and solutions. This analysis includes: a discussion of the environmental problems Chile will face in the next ten years and how the protected wildlands areas and their education programs can help. The objectives of Environment Education National Plan will also be presented here.

NATURAL HISTORY COMMUNICATION PROGRAMS AS A STRATEGY FOR ENVIRONMENTAL EDUCATION

Dr. Lawrence G. Castanares M.
Mexico, Distrito Federal, Mexico

BioImagenes de Mexico, S.A. de C.V. is an organization initiated in 1985 and works primarily on the communication of Mexico's Natural History. The main objective is to carry out an educational and popular orientation that will help people to appreciate the aestetic, cultural, economic and ecological values of the environment through programs of communication of Natural History for educative institutions, government and private organizations. Information on five years of experience will be given in relationship with the programs focus and objectives, communication media and support sources utilized. Results to date.

LA EDUCACION AMBIENTAL UN RETO PARA LA DECADA DE LOS AÑOS 90

Promoviendo los Programas de Educación Ambiental

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Abstract

This presentation outlines environmental education characteristics and the relationship of environmental education to sustainable development. It points out that work should not be based in simple actions trying to educate children and youth but should seek community leaders and social organizations. It presents the need for biologist to receive social aspects in their education. Environmental education must be integrated and multidisciplinary. It should promote the improvement of the quality of life without damaging the natural resources.

La década de los años 90, representa un reto para la conservación, especialmente en el campo de la Educación Ambiental. Si bien es cierto, en diferentes países se han obtenido algunos logros, también es cierto que es necesario replantear los enfoques y programas que se han estado hasta el momento ejecutando. Por lo tanto hay.

1) Una pregunta que es conveniente hacernos. ¿ Se relaciona la Educación Ambiental en nuestro país con el Desarrollo Sostenible ? Al respecto es importante reflexionar que estos conceptos deben de estar unidos, ya que la conservación es un instrumento para el desarrollo sostenible.

Este debe impulsarse tomando en cuenta la cultura de la comunidad y el correcto aprovechamiento de los recursos naturales, aspectos indispensables no solo para la satisfacción de las necesidades básicas humanas, sino para mejorar las condiciones de vida actuales de los pueblos.

El concepto de sosteniblilidad implica un concepto de mejoramiento humano, pero también respecto hacia cada uno de los procesos ecológicos esenciales, la diversidad biológica y responsabilidad solidaria con respecto a las generaciones debe estar presente el componente biológico y el componente social. Y no solo a nivel institucional sino a nivel global en los planes de desarrollo que realizan diferentes gobiernos, para su período de labores.

2) Otra pregunta que debemos hacernos es: ¿ Se limitan nada más los programas de Educación Ambiental actuales, a propiciar acciones de educación con niños escolares, jóvenes estudiantes y maestros ? Muchas veces esta población resulta de fácil acceso, pero si bien es cierto que el trabajo es muy importante con estos grupos, se orienta más la proyección hacia las futuras generaciones, olvidando el papel importante de los líderes, grupos organizados, organizaciones sociales (sindicatos, cooperativas, empresas de autogestión, asociaciones de desarrollo comunal) que juegan un papel importante en las comunidades aledañas a las áreas protegidas.

Los líderes naturales son los que orientan a lo grupos al logro de objetivos, su voz se escuha con respeto, y no se puede olvidar el papel de multiplicadores que pueden realizar en sus organizaciones, si se logra concientizarlos y motivarlos para una acción efectiva de Educación Ambiental. Trabajemos con las futuras generaciones, pero también con las fuerzas vivas de la generaciones actuales.

Por otra parte es necesario resaltar la importancia de que antes de iniciar un programa de Educación Ambiental, se debe contar con un diagnóstico integral de la comunidad, que incluya también valores tradicionales y creencias, y las caracteristicas de los grupos meta con los que se va a trabajar.

Sin esta información se puede caer en el error de iniciar un programa de Educación Ambiental, sin el método adecuado, sin jerarquización de necesidades, sin conocimiento previo de formas: tala, caza y quemas de bosques que utilizan los pobladores.

Ignorando la percepción que del área protegida, tienen los pobladores, se trabajará de una forma casuistica, e improvisada, y el programa que se ejecute estará destinado al fracaso.

3) Otra pregunta que es importante hacerse es: ¿ Reciben los biólogos y técnicos forestales dentro de su formación académica, contenidos del área social, que les permita tener una mayor claridad en su trabajo de Educación Ambiental que debe tener un enfoque interdisciplinario ? Después de trabajar algunos años con estos profesionales, he encontrado un vacio en el área social en su formación. También he preguntado a cientistas sociales de otros paises que laboran en el campo de la Educación Ambiental, y he recibido la misma respuesta.

Como primera reflexión es importante definir el ambiente como todo aquello que nos rodea, pero el hombre es parte fundamental del ambiente. Este concepto no abarca solo lo natural, sino lo cultural y lo espiritual. La Educación Ambiental es interdisciplinaria, donde juega un papel fundamental cada uno en su campo pero todos integrados logrando los objetivos: el biólogo, forestal, ingeniero, trabajador social, psicólogo, sociólogo y maestro. La educación relativa al ambiente es parte importante de la educación, ofrece pautas para una vida en armonía con otros seres humanos y el resto del medio. Por su ámbito extenso debe ser integradora, participativa e interdisciplinaria. Debe conducir a la solución de los problemas ambientales que tiene la comunidad. Por este enfoque es muy importante que se den contenidos del área social, a los estudiantes de biología y forestales para una mejor comprensión de los alcances de la Educación Ambiental. Los que tienen a su cargo el diseño de cursos en Universidades y otros institutos de educación superior deben revisar y actualizar los contenidos.

Por último deseo resaltar la importancia que tiene la capacitación permanente para las personas que planifican y ejecutan programas y proyectos relacionados con Educación Ambiental, a través de educación formal y no formal. Y la necesidad de evaluar la eficiencia y eficacia de los programas que se llevan a cabo en instituciones públicas y privadas, para determinar los ajustes que se requieren para trabajar con un enfoque de desarrollo sostenible

Tampoco se puede olvidar el papel de los políticos, a quienes muchas veces no se concientiza y están excluidos de la lista de destinatarios de los programas de Educación Ambiental en la mayor parte de los países.

No se los puede marginar ya que son los grandes actores, cuya acción es fundamental como formadores de opinión pública, y toma de decisiones para la consecución de recursos que fortalezcan los programas de Educación Ambiental en nuestras tierras.

En la medida que estos programas vayan orientados hacia diferentes actores, se diseñen en base a diagnósticos previos, y se evaluen periodicamente, la Educación Ambiental jugará un papel fundamental para el desarrollo del planeta tierra.

ONTARIO'S NATURAL RESOURCES EDUCATION POLICY: AN UNEXPECTED SUCCESS

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Abstract

Ontario's provincial natural resources agency, the Ministry of Natural Resources, instituted an environmental education policy in 1987. Three years later, with virtually no additional funding and staff, the policy has been successfully implemented throughout the province. This presentation will look at the variety of education programs available to the education community, and explain the reasons for their success.

Introduction

Over the past 10 years, a number of events have taken place which have encouraged the Ontario Ministry of Natural Resources to re-evaluate the role of education in their overall mandate.

These events range in diversity from the last of understanding on the part of the public about forests and forest management in Ontario (as evidenced in both the 1987 and 1989 Gallup Poll on forestry in Canada) to the emphasis on science and environmental issues in the recently rewritten provincial curriculum guidelines, specifically the primary/junior document Science Is Happening Here.

On another level, the current Ontario government is encouraging the public to become more directly involved in the resource decision making process. In order that wise resource management decisions may be made, it is important that all participants be as knowledgeable and well-informed about all aspects of Ontario's resources as possible.

In response to these events, the MNR has taken a pro-active step in providing natural resources education opportunities for the public by designing and implementing a policy statement on education.

The policy states that: The Ministry of Natural Resources is committed to providing educational opportunities for the public to increase its understanding and appreciation of the principles relating to natural resources and their management in Ontario.

This policy is intended to formally recognize the value of education programs, and to outline strategies for incorporating educations opportunities into the Ministry's function.

Problem

The Education Policy has been in place for approximately 3 years. In some district offices, it has become a major management priority, and in others, maintenance of basic resource management activities have placed it further down on the list of priorities.

There is a growing concern that, though some of the MNR's 47 district offices have reacted admirably to the policy, and are continuing or increasing their level of educational opportunities, some districts are participating in few or no programs. Because many people in the educations community are aware of the policy, demands for MNR's support and involvement are continually growing. A review of the policy and its implementation was necessary.

The Education Policy

In the MNR, each policy is implemented in a different fashion. Some have support dollars behind them, which, according to some staff, makes implementation easier. Some are changes to old policies, which require no additional funding to keep the status quo. Some are directives that all offices must adhere to, such as maternity leave policies.

Unlike these, the Education Policy was delivered as a statement of ministry commitment. It had no support dollars, and no directions or regulation regarding implementation. It was delivered from Main Office to be interpreted by the MNR's 47 field offices as they wished.

The literature on policy very clearly suggests that policy-making is one means by which organizations can co-ordinate and control the activities of their members. There are countless types of policy instruments, and numerous studies have documented the difficulty of converting policy into appropriate action. It appears that it is the implementation of the policy, whatever the type, that dominates the outcome. If this holds true, one can assume that if the Education Policy was not implemented successfully, there would be little or no education program delivery in a particular region.

Policy Implementation

In order to determine the implementation of the policy, an activity checklist was issued to all members of the Provincial Education Committee (PEC), as committee consisting of one representative from each program group in the MNR (Lands and Waters, Forest Resources, Outdoor Recreation) one from each of the 8 regions, and a representative from the Aviation and Fire Management Centre, and the Leslie M. Frost Natural Resources Centre.

These checklists were designed to monitor the number of educational opportunities taking place throughout the province during a six-month period. Each Regional PEC member was asked to implement the checklist as was most appropriate for their region.

In addition, a qualitative interview was designed to provide first-hand feedback on both provincial implementation, and district implementation of the policy.

The Results

Activity Checklist

The activity checklist was distributed to each regional representative at the PEC with a request to collect data from their region over the next 6 months. The data could be collected in any fashion the representative preferred, knowing that the results would be made available to senior management following the study.

The checklist collected the following information:

1) who is presenting the program
2) the group or audience
3) the size of the group
4) was the presentation requested
5) topic/key message
6) comments

The results of the checklist were predictable. Of the 8 regions in the ministry, only 4 collected data. Those 4 had a representative on the PEC who was already committed to the power of education. They returned to their region after receiving the checklist, and actively promoted educational opportunities. They also had an already-established network of staff and educators who were interested in natural resources education who were assisting them in their programs.

Two of the regions with no response had PEC members who were either not committed to education as a useful endeavor for the MNR, or had not established a network of staff and educators. Another was requested b y the Regional Director **not** to collect the data. The remaining neglected to collect the information for reasons unknown.

Interviews

Once more, the information generated from the interviews was predictable. As the literature suggested, because of the lack of a directed and supported policy implementation strategy (meaning directed from the top and supported with dollars) many staff felt that there was not a commitment from senior management to participate in educational opportunities.

This lack of support was traced down throughout the system. Because the main office senior management did not financially support the policy , district offices do not identify education as one of their priorities. Therefore, dollars are not allocated to its delivery.

Discussion

What became increasingly apparent as the study continued was the commitment and enthusiasm of individuals for education program delivery. The literature identifies all the roadblocks to effective policy implementation, and the MNR seems to fit each and every roadblock. The data collected from the activity checklists superficially supports the literature. But the truth is that there is a remarkable amount of education taking place in this ministry without the direction and without the support of additional dollars.

The reason became clear: individuals who care about natural resources and care about children. In one northern district, one staff person was told by her District Manager that education was not in her job specification and not a priority in his district. Yet she has spent 3 of the 4 Saturdays in May delivering Project WILD workshops to the local Roman Catholic School Board with no expectation of receiving compensating time for her work.

In another northern district, a forester attended a workshop to teach teachers about forestry education. He returned to the office, spent some time with this District Manager and School Board officials, and in August the office will be hosting a professional development day for every school board in the district boundaries.

In one southern district, the District Manager has identified education as on of his major district priorities. He expects all his staff to be able to deliver programs to educational audiences of all levels, and has one staff person acting as a liaison with the 6 local school boards. As a result, the schools have incorporated natural resources education into their local curriculum, and use the resources available from the office on an ongoing basis.

It becomes clear that the commitment for education is growing at the grass roots level, and that the policy that should be been totally unsuccessful is slowly but surely being supported throughout the province. It is individuals that are bringing natural resources education alive, establishing the network with local educators, and becoming a real educational resource.

Individuals responsible for carrying out the policy act not only from institutional incentives (and in this case, probably not at all), but from their own personal and professional motivation. The Ontario Ministry of Natural Resources is full of committed, caring and motivated individuals, and that is why the education policy is working.

REWARDING INITIATIVE IN ENVIRONMENTAL EDUCATION

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With ever increasing restrictions on resources to support Environmental Education, strong signals of support must be sent to teachers who are actively involved in promoting environmental education programs. The trials, tribulations and successes of new ventures to provide fellowships in professional development for teachers in agricultural, environmental and outdoor education in Alberta, Canada, are reviewed.

URBAN WILDLIFE EDUCATION EFFORTS IN COLORADO

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Abstract

Govenor Roy Romer has designated 1990 as Urban Wildlife Year in Colorado. Organizations have developed education programs, publications, a teacher resource packet, and a travelling exhibit to educate school groups and the general public about the urban wildlife found along the Front Range. This session will describe how other states may be able to adapt these programs for use in their own urban habitats.

Humans are not the sole inhabitants of cities. Many fragments of nature have survived urbanization. Wherever a patch of city greenspace exists, so does urban wildlife. All around the city, wayside plants and free-living animals can be accommodated in such unlikely places as sidewalk cracks, derelict buildings, irrigation ditches, railroad embankments and skyscraper ledges. You can keep the city out of the country, but you can't keep the country out of the city.

You don't have to pack up the kids and four-wheel vehicle to head for wilderness to see wildlife. Instead, stay close to home and try an attitude adjustment. Explore wildlife that you have previously stepped on, swatted, reviled unduly or simply overlooked in the urban setting.

There is a subtle, little-known daily cycle of nonhuman urban bustle. Along the Platte River Greenway, black-crowned nightherons quietly stalk suckers and minnows around shallow pools in the cool of the summer sunrise. A monarch butterfly alights on showy mildkweed to lay her eggs in the midst of morning rush hour traffic. Yellow-flowered prickly lettuce wedges its way into antique sandstone sidewalk cracks at Sixteenth and Pearl during an afternoon rain shower. Dusk brings out high-flying common nighthawks which, like winged vacuum cleaners, scoop up aerial insects over the United Bank building. After nightfall, red foxes hunt meadow voles in the lush willows and sweet clover that line reclaimed gravel pits along Clear Creek at Interstate 25. A lone, inconspicuous Woodhouse's toad makes itself at home on someone's front door welcome mat, gulping stunned bugs fallen from the searing porch light overhead.

Some of the most desirable wildlife is found at the most undesirable places. Garbage dumps, fetid pools of water and crumbling parking lots have their own strange brew of natural history. But many wildlife species still inhabit Denver's remnant patches of natural features--short-grass prairie, cottonwood-willow river bottom, ponderosa pine forest and cattail marsh.

Colorado's original landscape was interconnected; then it was fragmented into smaller and smaller pieces by human modifications. A mere twelve thousand years ago at the end of the Pleistocene, the Front Range climate and setting were much like they are today--open plans threaded with river valleys. Mountane glaciers were receding. The climate was becoming warmer and drier as we entered the current interglacial period. The prairie was thinly populated by humans and packed with free roaming herds of large herbivorous mammals. Native hunters and gatherers shared the prairie with bison, flat-headed peccaries, camels, elk, mammoths, deer, muskoxen and pronghorn. As notions of private land tenure took hold, those of land stewardship faded with the prairie. Today's prairie landscape is increasingly dominated by people, cities and agriculture; wildlife is subordinate.

Although urbanization of Colorado's Front Range implies alteration and replacement of natural ecosystems, it can be planned with an eye to retaining cottonwood-willow river bottom, cattail marsh and short-grass prairie. Enlightened urbanization harmonizes the human-built cityscape with the Earth-formed landscape. Profitability and preservation can be compatible.

Because of the wide range of altitudes and ecosystems represented along Colorado's Front Range, its cities enjoy large numbers of prairie, canyon, riverine, foothills and montane wildlife. There are around 400 species of common fish, amphibians, reptiles, birds and mammals that inhabit Front Range urban areas, not to mention the even more numerous invertebrates and plants.

Many wildlife species are gone from other cities in the United States. The Front Range urban corridor, because of its relatively recent settlement and large remaining undeveloped areas, has been spared some of those losses. Gone are the bison, wolf and black-footed ferret, but on the urban fringe remain the mountain lion, black bear and bald eagle. These species depend on large natural habitat remnants from such disparate entities as Rocky Mountain Arsenal, Pawnee National Grasslands, Rocky Mountain National Park and Roxborough State Park.

The most rapidly expanding habitat on the Planet Earth is the city. By the year 2000, nearly half of the Earth's projected population of 6 billion humans will live in urban areas. In the United States, 90 percent of the 300 million population will live or work in cities by then. Over 80 percent of Colorado's population lives along the Front Range from Pueblo to Greeley. Each of these cities has a unique cultural history, but all have urban wildlife in common.

As Colorado's Front Range population continues to grow, there will be increased attention to the importance of urban wildlife. It is incumbent upon city and suburban dwellers, urban planners, wildlife managers, landscape designers and local government officials to preserve existing urban greenspaces now. New residential and commercial developments, military installations, abandoned industrial sites, polluted rivers, overgrazed pastures and vacant lots also have great potential for creating new habitat for urban wildlife. By creating livable habitat for humans and wildlife, we will insure the quality of life to which Coloradans are accustomed.

Adapted from:

Rinehart, F.R., and E. A. Webb, Editors. 1990. Close to Home: Colorado's Urban Wildlife. Roberts Rinehart, Boulder, CO, 192 pp.

ESTRATEGIAS DE EDUCACION AMBIENTAL EN EL NORTE DE MEXICO

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México es un país con un alto potencial biólogico, tiene un enorme número de especies endémicas, desgraciadamente este potencial, está declinando seriamente, la situación socio-politica-económica del país, el bajo nivel de conciencia de los mexicanos hacia los recursos naturales y la falta de apoyo a los programas de Educación Ambiental contribuyen a este problema.

Profauna, asociación para la conservación no gubernamental, la Universidad Autónoma Agraria "Antonio Narro", Piney Woods Conservation Center at Stephen F. Austin en Texas y Cal-Wood Environmental Education Resource Center en Boulder Colorado han unido esfuerzos para crear programas de Educación Ambiental para el norte de México; iniciándose esta tarea en 1988, año en que se organizó el primer curso de capacitación en Educación Ambiental para

maestros y técnicos de los recursos naturales, en el centro Piney Woods en Texas.

A raíz de los buenos resultados obtenidos del primer curso se organizó un segundo y tercero, fueron en agosto de 1989 en Piney Woods en Texas y en 1990 en Cal-Wood, Boulder, Colorado. Con el personal capacitado en estos cursos se han realizado diferentes actividades en Coahuila, por ejemplo probar y adaptar el material adquirido en los cursos, la capacitación de maestros de jardín de niños, primaria y secundaria, poniendo a su disposición material de fácil uso en el salón de clases ya que son adaptables a todas las áreas de los programas escolares, además se contó con el apoyo del personal técnico de los recursos naturales, para en conjunto mejorar la enseñanza de la Educación Ambiental. Otra de las muchas actividades que se han realizado son los cursos cortos para niños de preescolar, primaria y secundaria, como también para estudiantes de escuelas técnicas y universidades, sin dejar de mencionar la organización de congresos y conferencias sobre Educación Ambiental para profesionales, estudiantes y público en general.

Es importante mencionar tambien la activa participación de la comunidad Coahuilence en las actividades realizadas por miembros de este programa que se llevan a cabo en diferentes lugares, por ejemplo en los parques públicos de varias ciudades de este estado; actividades como la celebración del Día de la Tierra.

Asi, se han realizado muchas mas que han tenido gran impacto, no solo en el estado de Coahuila sino tambien en los estados vecinos.

Otra de las estrategias de este programa es capacitar personal en los Estados Unidos por mas largo tiempo, el lugar de capacitación queda en Boulder Colorado en el centro de Educación Ambiental "Cal-Wood", donde hasta la fecha han logrado su capacitación dos personas, una por un año y otra por cuatro meses.

Este programa ha tenido gran éxito debido a la participación de las instituciones y personal que laboran en:

1. Una de las expectativas para el futuro es lograr capacitar el mayor número posible de maestros de diferentes niveles escolares, capacitar técnicos en Educación Ambiental y hacer crecer el programa hacia otras partes de la República.

LA EDUCACION AMBIENTAL FORMAL EN MEXICO
IMPLICACIONES INSTITUCIONALES Y PROYECTOS EN MARCHA

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México

Abstract

A program of educational moderization initiated by President Salinas De Gortario has offered an opportunity to incorporate the environmental dimension into the education system, mainly at the basic level. The success of this reform as well as the degree of institutional resistance will be discussed.

Están las escuelas para reproducir la sociedad existente o para generar las condiciones sociales de su transformación? Dilema que ha dado origen a distintas corrientes pedagógicas. Desde la perspectiva de la educación ambiental, se opta por lo último, en tanto no puede concebirse la idea de una escuela que contribuya a reproducir las características de una Saciedad que propende hacia la destrucción de sí misma y de todo lo que le rodea. Sin embargo, en base a los hechos actuales, y en relación con la función que cumple en cuanto a la formación de una conciencia ambiental, la escuela es más reproductora que transformadora.

Situación que está determinada por diversos factores:

- La organización de la institución escolar contribuye significativamente a la distorsión de un enfoque ambiental globalizador e interdisciplinario dentro de la educación formal. a) Por los aspectos administrativos, y b) Por la separación de las áreas de aprendizaje o asignaturas que existen en el curriculum escolar.

Esta situación poco favorece el tratamiento de la dimensión ambiental en forma integrada, circunscribiéndola basicamente al lugar destinado a las ciencias naturales dentro del curriculum de la educación básica. Al mantener desarticulados los aspectos ambientales del campo de las ciencias sociales, como planteé en otro trabajo (1989:14), el estudiante no puede reconocer su propia responsabilidad y la de la sociedad en los problemas, inclusive lo persuade de que la solución se restringe a lo estrictamente técnico.

- Los contenidos de la enseñanza conllevan en muchos sentidos el germen reproductor, aunque caben los señalamientos de los análisis semiológicos de la cultura que en un mismo texto las distintas personas reconocen diversos significados; significados que son sustituidos por uno propio.

Uno de los principales obstáculos para que la escuela coadyuve en lograr una conciencia ambiental, es que como esta hecho el curriculum tiende a impedir que los sujetos revisen el lugar que guardan dentro del todo social. Porque ésta no puede desprenderse del conjunto de factores que caracterizan una formación social dada: económicos, políticos, culturales, etc.; ¿Cómo inducir la formación de una conciencia ambiental cuando la causa de los fenómenos ambientales se oculta o se restringe a la conducta individual? ¿Cómo propiciar la participación responsable de la comunidad en la resolución o mitigación de los problemas, cuando los diversos intereses existentes se enmascaran? ¿Cómo favorecer la formación de hábitos y actitudes más respetuosas hacia el entorno, si los intercambios entre los agentes económicos se conducen conforme a arreglos desconocidos para la gran mayoría?

De ahí es que la educación ambiental para estos intereses se convierta en una acción subversiva, porque genera rupturas dentro de las esclerotizadas estructuras escolares y sociales; porque desmitifica los nichos en que se han colocado ciertos procedimientos perpetuados más en función de la tradición que de su legitimidad. Para ello, es preciso superar esta pedagogía de la prohibición en la que, a menudo, se circunscribe la educación ambiental para transformarla en una pedagogía de la posibilidad.

- La incorporación de los aspectos ambientales se han orientado básicamente a la adición de contenidos ecológicos. Restringir a solo esto, soslaya la necesaria vinculación entre lo natural y lo social, representando un planteamiento imcompleto, que impide la comprensión cabal de la complejidad de los fenómenos. Además pretender explicar los procesos educativos en función de los contenidos, sobreestima el rol de la información en el desarrollo de hábitos y actitudes.

La formación de una conciencia ambiental requiere insistir en el sustrato socio-afectivo de los procesos educativos, lo cual no significa un aumento de dosis de información. Esa es la posibilidad que se tiene para propiciar aprendizajes significativos, tendientes a inducir determinadas pautas de comportamiento.

Con base en estas consideraciones teórico-metodológicas, en México se han emprendido los trabajos dirigidos a incorporar la dimensión ambiental en los procesos escolarizados. La mayoría de ellos se han dirigido a la educación básica, por su cobertura que es de casi 22 millones de niños y porque en esta edad es posible propiciar cambios actitudinales. Sin embargo, y pese que se han establecido programas conjuntos entre la Secretaría de Desarrollo Urbano y Ecología (SEDUE), y la Secretaría de Educación Pública (SEP) y la Secretaría de Salud (SSA), no ha sido fácil impulsar estas acciones desde un espacio institucional externo a la SEP.

En los países donde la educación ambiental se localiza en los ministerios del medio ambiente, si bien encuentra complicaciones, tiene ciertas ventajas como que permite analizar necesidades de educación ambiental en la estructura global del sistema educativo, al margen de la subdivisión institucional de las funciones y atribuciones por nivel y modalidad.

Es así que en México se han promovido eventos sobre educación ambiental formal, donde han participado representantes de los niveles preescolar hasta educación superior[1]. Esto facilitó la integración de propuestas, en base a las opiniones y consideraciones de los diversos sectores consultados, a partir de las especificidades de cada nivel. Propuestas que se han sustentado en estudios evaluativos que la SEDUE ha encargado a grupos académicos que conocen este campo y que muestran los aciertos y las inconsistencias en los materiales curriculares vigentes.

Las tareas en educación ambiental formal, no se han limitado a incorporar la dimensión ambiental en los aspectos formales del curriculum escolar, ademas se ha trabajado en escuelas de distinto nivel y tipo, impartiendo ciclos de conferencias acompañadas con material audiovisual, promoviendo campañas sobre basura, reforestación, aprovechamiento racional del agua, entre otras, así como proporcionar diversos materiales impresos que los maestros pueden emplear para reforzar sus actividades de enseñanza.

En cuanto a la educación superior desde 1988, se vienen celebrando los Encuentros Nacionales sobre "La Formación de Profesionistas ante la Problemática Ambiental". El primero fue en Querétaro, participaron representantes de 20 universidades y/o dependencias de 15 estados y de la zona metropolitana de la ciudad de México. El Segundo se efectuó en octubre de 1989 en Tonatico, Edo. de México, participaron 40 delegados de 22 instituciones de educación superior del país, y representantes de ANUIES, CONACYT, SEDUE y la fundación Friedrich Ebert. El tercero se realizará en Guadalajara en noviembre de 1990.

Los Encuentros buscan impulsar la colaboración interinstitucional en materia ambiental; en docencia, investigación y extensión. Hasta ahora han generando nuevas condiciones para la realización de un mejor trabajo en este sentido y, mas aún han ampliando la preocupación por iniciar proyectos en esta importante área.

Puede afirmarse, que la educación ambiental en México adquirió en la pasada década, no sólo su reconocimiento como un nuevo campo del quehacer pedagógico. Es difícil anticipar seriamente cuáles serán los avances en educación ambiental en la década que recién iniciamos; es importante, no obstante, consolidar el campo para que no se inscriba como una moda pasajera más, sino como un espacio vital en el que tendremos que actuar con mayor decisión y energía.

Ciertas tareas se identifican como necesarias para poder delinear el perfil de la educación ambiental formal para la próxima década en México.

1. Desarrollo curricular. Es imprescindible continuar investigando estrategias conceptuales y metodológicas para incorporar la dimensión ambiental en el currículum escolar, a partir de la categoría epistemológica de totalidad; lo cual favorecerá una comprensión más integradora de la realidad, al debilitarse las artificiales fronteras que el abordaje por disciplinas ha establecido para los diversos campos del saber[2].

   Este trabajo en México, asumirá sus propias características en función de las tradiciones institucionales y de las directrices políticas del actual gobierno en el proceso de modernización educativa; pero las aproximaciones conocidas distan aún mucho de lo que se considera deseable[3]. Se requiere una mayor insistencia internacional para reforzar la labor que desde adentro se realiza.

2. Formación docente. Cualquier intento viable de reforma educativa debe tomar en cuenta la formación de maestros, esto se hace más evidente cuando se analizan las posibilidades de reforzar el papel de la escuela en la formación de una cultura ecológica en los niños y jóvenes de la sociedad, Por lo tanto, mejores materiales curriculares son condición necesaria, pero no suficiente para modificar el estado de cosas al interior de la institución escolar.

   Para favorecer una adecuada formación ambiental teniendo en cuenta el conjunto de dificultades de diverso tipo que complican la articulación de las distintas áreas curriculares en torno a los temas ambientales, es necesario proveer a los maestros de las herramientas intelectuales que les permitan orientar la consecución de aprendizajes significativos.

La educación aparece como respuesta a las dimensiones éticas y políticas del problema ambiental y eso exige la asunción de un compromiso por parte del maestro, no sólo para conocer nuestros derechos por un ambiente sano, por un futuro, por una posibilidad, sino para luchar por ellos.

Notas

1) I. Coloquio de Ecología y Educación Ambiental. Concepciones, Perspectivas y Experiencias. SEDUE, (CESU) de la UNAM. 1987, Ciudad de México. Taller sobre Metodología de la Educación Ambiental, SEDUE y la Fundación Friedrich Ebert (FES), en Taxco, Gro., en 1988; I. Seminario-Taller sobre Educación Ambiental Formal SEDUE, la SEP y la FES, 1990, Metepec, Pue.

2) Con apoyo de World Wildlife Fundation, del 22 al 25 de julio de 1990, Cocoyoc, Mor., la SEDUE convocó al Seminario "La Educación Básica en México y la Problemática Ambiental". A este evento asistieron destacados investigadores de las ciencias sociales y naturales.

3) Si bien la SEP en lo que respecta al proceso de Modernización Educativa has considerado un línea de formación ecológica para la reestructuración de los planes y programas de estudio; también se encuentra incorporando la asignatura de Ecología en el nivel de secundaria. Todo ello refleja un conjunto de orientaciones divergentes dentro de los equipos de trabajo y de posiciones que se resisten a admitir sugerencias externas.

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